

BUILT LIKE A BRIDGE



Reliance HY-CROME Spring Washers

FOR

TRACK APPLICATIONS



"Edgemark of Quality"



EATON MANUFACTURING CO. RELIANCE SPRING WASHER DIVISION, MASSILLON, OH

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

Reproduction of this Ad. (free from advertising) suitable for framing, upon request.

rust preventive

NO-OX-ID*

LABOR-SAVING RUST PREVENTIVE

Coating joint bars, track bolts, and bond wires with NO-OX-ID.

NO-OX-ID provides permanent protection to both interior and exterior of water tanks.

NO-OX-ID applied to bridges stops loss of metal thus maintaining original structural strength.

* No pre-cleaning necessary!

Cleaning rust and old paint from steel structures before repainting is a labor consuming, costly job. When coating with NO-OX-ID, it is not necessary to clean off all traces of rust and paint. This saves up to 50% of labor time . . . which is mighty important these days when maintenance crews are operating short handed.

All you need to do is to scrape off the loose rust patches and then spray or brush on a coating of NO-OX-ID. It will penetrate to the metal, stop further corrosion, and loosen old rust scale. Then just touch up later with NO-OX-ID. This is the most economical method of protecting your steel structures against corrosion.

DEARBORN CHEMICAL COMPANY
Dept. U, 310 S. Michigan Ave., Chicago 4, Illinois
NEW YORK • LOS ANGELES • TORONTO

• For Victory, Buy United States War Bonds and Stamps •

NO-OX-ID
IRON RUST
rust preventive

NO-OX-ID
WRAPPER FOR
PIPE LINES

THE LEADER

FOR 25 YEARS



HOW TO MAKE TOUGH JOBS EASY!



ROCK BREAKING



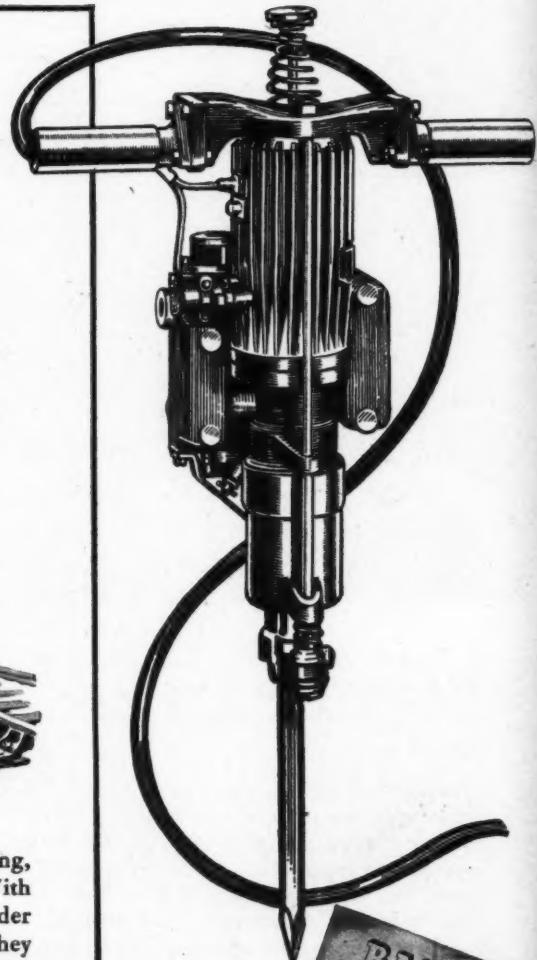
EASY TO CARRY



FIELD POST DRIVING



TYTAMPING



Barco Hammers are just as good for drilling, driving, digging or breaking as they are for tamping. With eleven special tool attachments, every job is made to order for these hard-hitting, steady-working lightweights. They cost little to operate and can be carried everywhere. Better send in the coupon for details.

BARCO MANUFACTURING COMPANY, NOT INC.

BARCO

PORTABLE GASOLINE HAMMERS

Light in Weight  *Rugged in Construction*

BARCO MANUFACTURING CO., NOT INC.
1803 Winnemac Ave., Chicago 40, Ill.

Gentlemen:

Without obligation on my part please send me a copy of the
BARCO HAMMER BOOKLET.

Name _____

Street _____

City _____ State _____

BEFORE AND AFTER



- Before the war, we enjoyed a reputation for producing quality railroad tools, as exemplified by the Devil Line.

You will recall some of our product features, such as sharp, long-life cutting edges and the tough, precision-formed striking faces.

During the war, despite the fact that we are producing more tools than ever before in addition to other types of war goods, we have maintained our high quality in workmanship.

The Warren Tools you buy after the war will be precision-made just as those you bought yesterday and are buying today.



WARREN TOOL CORP. • WARREN, OHIO



**"MULTI PLATE
is the only
practicable structure
that can be used"**



That's what a main-line railroad official said about ARMCO Multi Plate needed to replace a structure that had failed by undercutting.

It's easy to see why engineering and maintenance men rely on Multi Plate to overcome severe service conditions. It is easily installed and you can reline or replace an average small bridge in a few days without interrupting traffic.

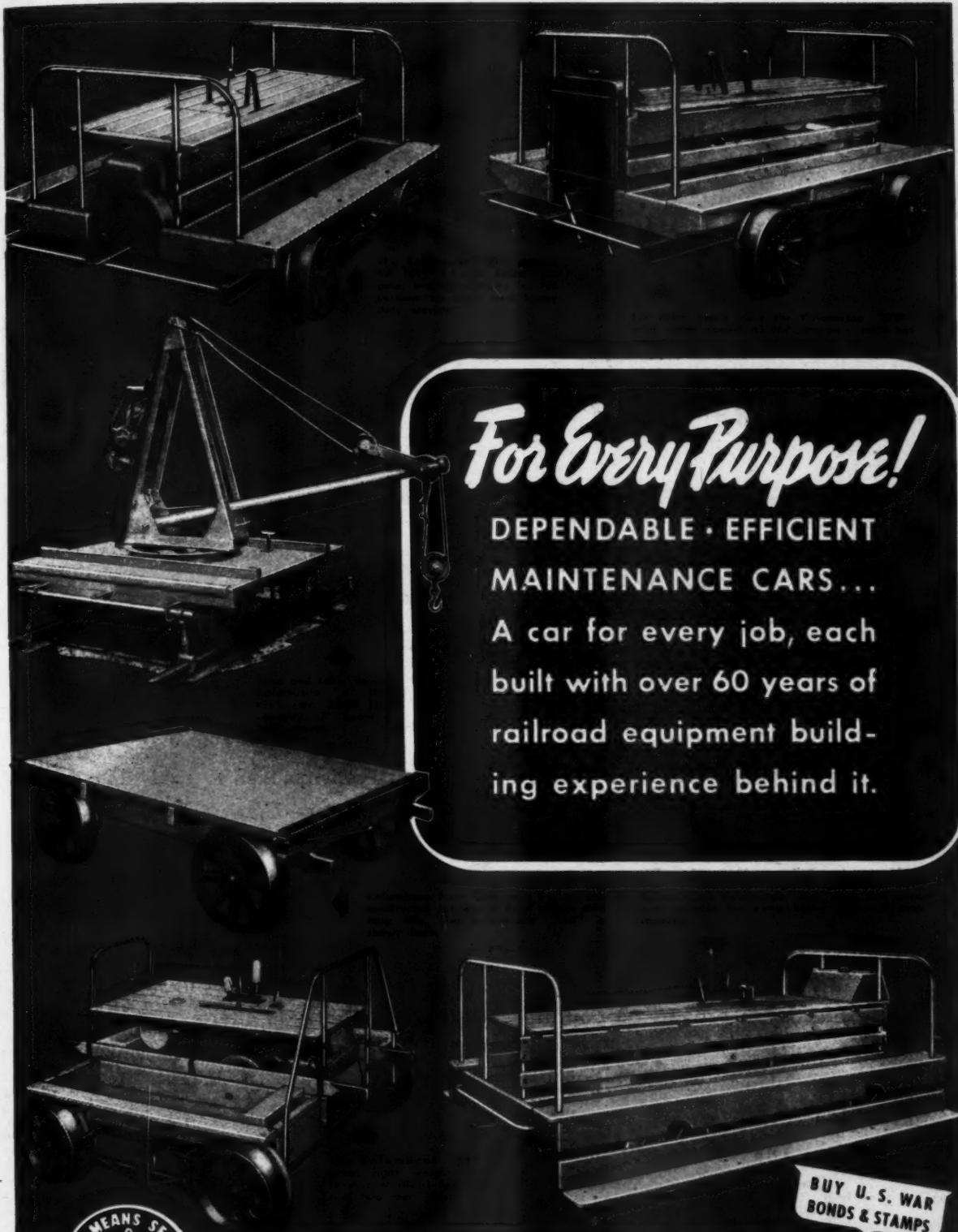
The rugged Multi Plate sections can be assembled by your regular crew without special equipment, and in any weather. Once the job is completed with backfill and headwall, you have a bridge strong enough to withstand any railroad loading condition.

Not every order for Multi Plate can be filled. The steel may be needed more urgently somewhere else. Even so, you will want to have all the facts on ARMCO Multi Plate Pipe and Arches when you start restoring war-weary roadbeds to peak efficiency. Write to Armco Railroad Sales Co. Incorporated, 651 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO MULTI PLATE Pipe and Arches





For Every Purpose!

DEPENDABLE • EFFICIENT
MAINTENANCE CARS...

A car for every job, each
built with over 60 years of
railroad equipment build-
ing experience behind it.

BUY U. S. WAR
BONDS & STAMPS

Detailed information for these and other cars on request.

KALAMAZOO RAILWAY SUPPLY CO.

KALAMAZOO, MICH., U. S. A.

MANUFACTURING SINCE 1883



Muck and Mud at Alaska...
Rugged Hills of Italy...
Bottomless Roads of Russia...
have Proved
CLETRAC
TRU-TRACTION
Again and Again



For twenty-five years Cletracs have had controlled differential steering—which simply means power on *both* tracks at *all* times. We call it *Tru-Traction*.

Practically every high-speed crawler-type military vehicle has employed this type of power application. And how its value has been proved on countless military roads and plains where other types of equipment would have stalled and bogged down!

Isn't it sensible then, to apply this same kind of power—*Cletrac Tru-Traction*—on your jobs where you must have positive power on both tracks at all times—power to make a *full* turn with a *full* load—power to go through tough going—power to spot loads easily—power that will get you there regardless of ground and weather conditions?

Then rely on Cletrac—the only crawler with *Tru-Traction*.



THE CLEVELAND TRACTOR COMPANY • CLEVELAND, OHIO

CLETRAC *Tru-Traction* TRACTORS

GASOLINE OR DIESEL

BLUE BRUTE TRACK TEAM IN RAILROAD MARATHON



BLUE BRUTE Track Teams are tamping ties in the biggest railroad marathon in history. As the nation hurls its inland resources against the enemy, railroad men are counting on Blue Brutes for "the last quarter mile that wins the race."

Blue Brutes win because they're trained for better teamwork. One Blue Brute portable Hand-i-air Compressor, the Worthington "packaged hurricane on wheels", delivers 60 cu. ft. per minute to our WTT-7 Tie Tamers. *Just right*

for smooth air delivery through Feather* Valves, best in the long run.

You get no grandstanders. No throaty prima donnas waste your time, chew up your profit. A real team of straight-shooters, this famous five is matched for easiest handling.

Results? More air delivered, less air wasted, lower costs per foot of finished track — in short, *your money's worth* for each tie tamping dollar. Proof? Look who uses them — then try them!

*Reg. U. S. Pat. Off.

Behind the Fighting Fronts
with

BLUE BRUTES

Blue Brutes helped equip several railway battalions for overseas duty. Here, at home, our soldiers and sailors see them in action** for track-laying and repair, as well as for new construction in Army camps, Navy yards, air bases and ordnance plants.

**Blue Brute compressors and air tools are painted olive drab for the Army, battleship gray for the Navy.

Get more **WORTH** from air with **WORTHINGTON**
Buy BLUE BRUTES



Compressors from 60 to 500 cu. ft. capacity in mounts to suit all jobs. Rock Drills and Air Tools that have

always set the pace for easy operation — available in a wide range of weights and sizes.

WORTH
WORNINGTON



Worthington Pump and Machinery Corporation, Harrison, N. J. Hlyoke Compressor and Air Tool Department, Hlyoke, Massachusetts

**LINK-BELT SPEEDER
POINTS THE WAY TO Post War
SHOVELS-CRANES-DRAGLINES**



Off-Track Equipment

Today, Link-Belt Speeder shovels, cranes, draglines are on the job for railroads throughout the country proving their efficient, maintenance-free, out-of-the-way and off the right-of-way service. They and others to follow will provide the railroads with an added advantage in competitive transportation days to come. There are 25 models of Link-Belt Speeder shovels, cranes, draglines available—a type and size to fit every job. Make a Post War "memo" to find out about them!

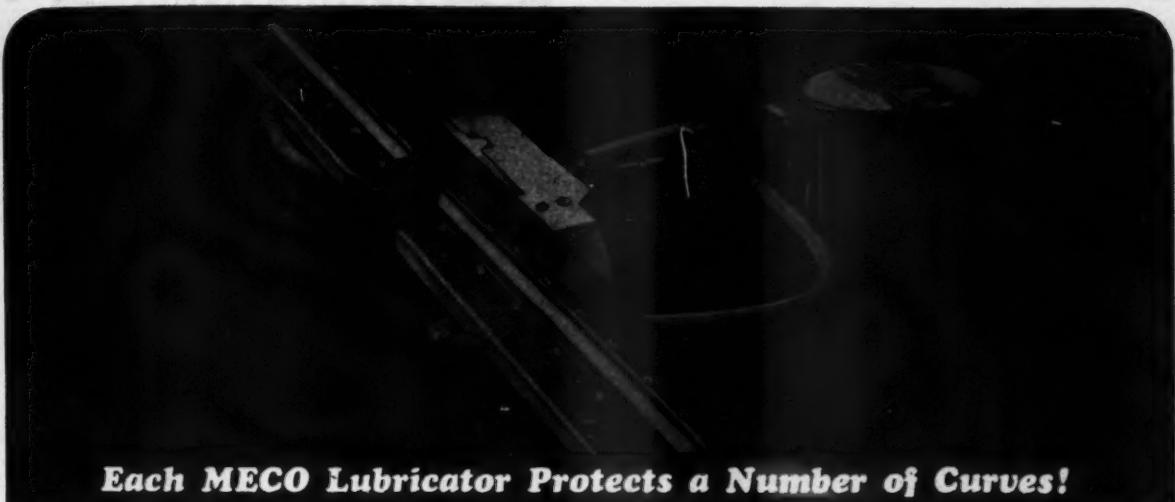
9419

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO 9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

Avoid "Slow Orders" on Curves



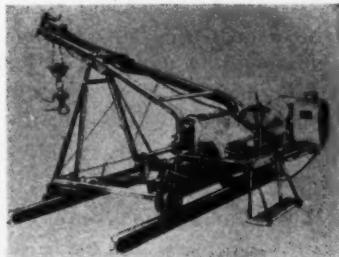
Each MECO Lubricator Protects a Number of Curves!

by Installing

MECO LUBRICATORS

MECO LUBRICATORS put a SLOW ORDER on CURVE RAIL WEAR. Speed up trains by making Curves safer for high speeds. Prolong curve rail life.

POWER RAIL LAYER



Requires no train orders.

MACK SWITCH PROTECTORS



Makes switch rails last 8 to 10 times longer.

MAINTENANCE EQUIPMENT COMPANY

RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS

THE HOW AND WHY OF

THE PROPER USE OF OPEN-END WRENCHES . . . Data Sheet No. 22

First, select a wrench with the correct size opening for the nut or bolt to be accommodated. Test this by the amount of free back and forth movement of the wrench on a stationary nut. Too large an opening may slip under a hard pull and injure you, the nut, or the wrench.



Any wrench will perform best and with highest strength when squarely and fully seated on the nut or bolt head as shown above. Pull straight, avoiding side strain or

"cramping" of the wrench. Nine times out of ten you will find it safer to *pull* rather than *push* on a wrench. Greasy hands... or greasy wrenches... are dangerous. A dry, clean grip always permits the hardest, safest pull and helps to reduce accidents.

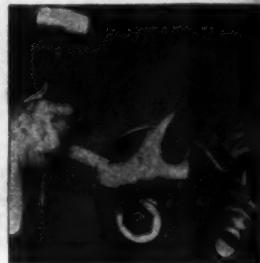


Never use a wrench with a badly worn or chewed and spread opening as pictured above—particularly on hex nuts. Williams' Wrenches are stamped with the nominal size of their openings; that is, the size of the nut or bolt head across the hex or square flats. Openings are made .005" to .040" (proportionate to size) larger than the nut or bolt head they are intended to fit. It is, therefore, easy to detect spread openings.

WILLIAMS

DROP-FORGED TOOLS

Standard commercial wrench leverages are such that an average man can readily break bolts or strip threads up to 5/8" bolt diameter. Consequently care should be exercised and a sense of "feel" developed. Bolts larger than 5/8" seldom can be set up too tight with average wrench leverages. If you must use auxiliary leverage on large bolt sizes, such as a pipe extension over the handle, make sure the two are strongly and well coupled. The best and safest procedure is to purchase special wrenches with extra long handles.

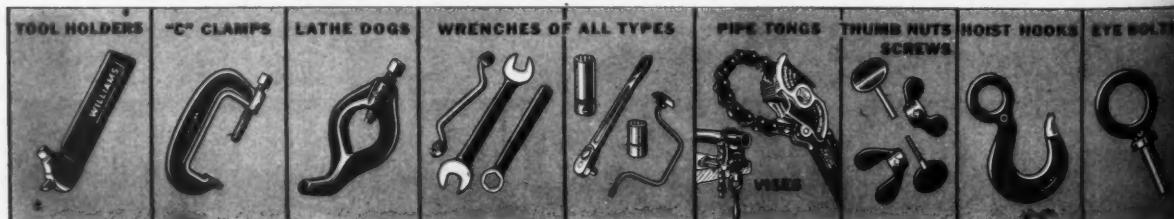


Never hammer an ordinary wrench handle as a substitute for increased leverage. *Striking-face* wrenches, (see above illustration) made specially for this purpose, should be used. A vast amount of energy is stored in several sharp hammer blows, and ordinary wrenches are not designed to withstand this abuse.



When the usual open-end wrench is operated in close quarters on hard-to-get-at nuts, it should be remembered that "flopping" the wrench upside down between swings gives an angular advantage which permits continuously rotating the nut, or bolt in the least possible space. By this "flopping" trick, illustrated above, the usual 15° angle wrench will operate a hexagon continuously where the swing is limited to 30°; otherwise 60° would be necessary.

Sold by Leading Industrial Distributors Everywhere . . . J. H. Williams & Co., Buffalo 7, N. Y.





Track Appliances for SAFETY AND ECONOMY



Q & C
Hand Throw
Derails



Q and C Guard Rail Clamps

GUARD YOUR
SWITCH POINTS
AND SAVE
LABOR
OF RENEWALS



Q and C Switch Point Guards



Q and C One-Piece Manganese Guard Rails



Q and C Step Joints

THE Q AND C CO.

NEW YORK

Serving Railroads Since 1886.



CHICAGO



ST. LOUIS



**YOU CAN'T JUST HAND A MAN A BRUSH AND SAY:
"PAINT THAT BRIDGE!"**

If that's all there was to it, bridge maintenance costs would be a lot lower than they are. Bridge painting however, involves much more than the mere application of paint on steel.

Organization, management, equipment, materials . . . and just as important . . . specialized skill, are the vital factors that make it possible for Morrison to say, that because of our wide experience and knowledge of railroad practices . . . *we can do it better for less.*

It will cost you nothing to have one of our field experts survey . . . either a single bridge or your entire line . . . and submit an estimate or quotation based on your specifications. May we do it?



Let the HIGH QUALITY of

OLIVER TRACK ACCESSORIES

REDUCE YOUR TRACK MAINTENANCE

TRACK BOLTS

You need the built-in toughness, high quality and dependability of Oliver Track Bolts to safely meet ever-increasing haulage demands. Accurate dimension and uniform, clean threads mean quick assembly and tight, solid joints.

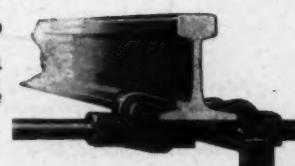
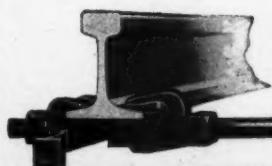


FROG & CROSSING BOLTS

Oliver Frog and Crossing bolts provide the extra strength and toughness needed for this service, through carefully selected steels and controlled heat-treatment. They are accurately made, cleanly threaded, grip tight and make safe, dependable connections.

GAGE RODS

Oliver Gage Rods anchor both rails together in a single load-sharing unit. Engineered to maintain accurate gage on stiff curves, main switches, near rail crossings, they eliminate frequent re-gaging, excessive re-spiking.



OLIVER

Corporation

SOUTH TENTH AND MURIEL STREETS • PITTSBURGH, PENNSYLVANIA



Another PERFORMANCE REPORT ON J-M ASBESTOS SHINGLES --



VALHALLA, NEW YORK

WHEN APPLIED: 1914

MAINTENANCE: No expense since installation, almost 30 years ago.

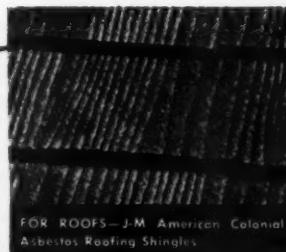
PRESENT CONDITION: No signs of deterioration of any kind.

REMARKS:

Despite 30 years' exposure to the wide variations in temperature between summer heat and winter snow and ice in this part of the country, the Johns-Manville Asbestos Shingles on this railroad station roof are as serviceable as ever. These shingles, made of asbestos and cement, are as permanent as stone. They are rotproof, fireproof, and never need preservative treatment.

Johns-Manville Asbestos Roofing Shingles and Siding Shingles are now available for permanent repairs and new installations where necessary. For complete details, write Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.

JOHNS-MANVILLE



FOR ROOFS—J-M American Colonial
Asbestos Roofing Shingles



FOR SIDEWALLS—J-M Cedargrain Tex-
tured Asbestos Siding Shingles

JOHNS-MANVILLE

86 YEARS OF SERVICE TO TRANSPORTATION

• Insulations • Packings • Friction Materials • Refractory Cements • Building Materials

AT 60 TO 100 MILES
PER HOUR

TRACK MUST BE GOOD



GOOD TRACK MEANS UNIFORM TRACK WELL TAMPED. Section gangs with modern track equipment to aid them are doing an excellent job of maintaining good track.

The basic piece of equipment in a modern section gang is, of course, the compressor that supplies compressed air to operate the lightweight, powerful — Tie Tamers, Spike Drivers, Track Wrenches, Grinders, Riveters, Wood-Borers, etc.

One of the most popular mobile air compressor units is the DR-60 Spot Tamper, a 60 cubic foot machine that will operate four MT-3 tie tampers.

- Equipped with either wheels or rollers.
- Two-stage air-cooled compressor.
- For use either "off-track" or "on-track".
- Push button starting.
- Only 32 inches over-all width.
- Cover for locking.
- Easily moved to next location.
- Front and rear handle bars.

Ingersoll-Rand engineers will gladly assist you in selecting the proper pneumatic equipment for your mechanized section gangs. Send for a copy of our booklet, "Air Tools and Compressors for Railroad Maintenance of Way," Form 2712.

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

11-416

ORIGINATOR OF MECHANICAL TAMPING



The UNIT RAIL ANCHOR

**Improved Heat Treatment makes
Quality better than ever**



1. Anchor is quickly forced into position by pressing down on tool handle



2. Anchor in top notch position
grips new rail tightly

The Unit Rail Anchor is a one-piece device, with two notches, the top notch for new, the lower for undersized, rail. The holding power in either notch is more than sufficient to withstand the severest strain. It is easily applied, and can be reapplied any number of times. The anchor is made of high carbon, high manganese steel, specially heat treated in Homoelectric furnaces automatically controlled. This gives the anchor a tougher and more ductile structure resulting in longer service. It is round edged to reduce penetration in the ties.



3. In lower notch position grips undersized rail tightly



4. To remove Anchor, tool is applied to upstanding end of Anchor and pressed downward

New York Office

3712 Woolworth Bldg.
235 Broadway
New York (7), N. Y.

UNIT RAIL ANCHOR COMPANY, INC.

Subsidiary of Hubbard & Co. — Tool Division

Manufacturers of Quality Railroad Track Tools and
Alloy Spring Washers per A.R.E.A. Specifications

6301 Butler Street
Pittsburgh (1), Pennsylvania

Chicago Office

Room 924
332 S. Michigan Ave.
Chicago (4), Ill.

YOU CAN'T DO THIS WITH A TRACK CRANE!



WHERE do you have work to do on your division? Put your Northwest on a car—it loads itself quickly under its own power—meets clearance without major dismantling—take it off at the job and you are ready to build shoulders, slope banks, ditching, pile driving, culvert construction, new right-of-way, ballasting, rail setting—anything that requires material handling or excavation.

Or if you have loading to do, operate right

from the car, travel from flat car to flat car or through drop-end gondolas.

No other type of maintenance machine can do what a Northwest crawler will do. You are planning for the future, and there are big things ahead for the railroads. A Northwest will materially speed up maintenance of way. It has been proved by the leading railways of the country. Ask for details.

NORTHWEST ENGINEERING CO., 1713 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Illinois

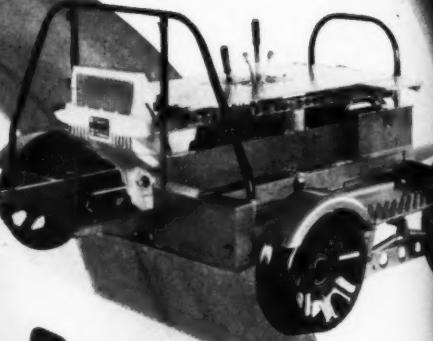
NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

PROVED
on the nation's
LEADING
RAILROADS



KEEPING WHEELS



M1 Series E—This is a 2 to 4 man car for inspection work. It is not only a reliable car, but a valuable piece of equipment. It is built of heavy steel and has a 1000-lb. load capacity. It is powered by a 10-hp. motor. Bulletin 396.

A5 Series C—A 3 to 8 man car for heavy duty service. It has a 10-cylinder Waukesha Engine and a 3-speed transmission. It can be driven forward or reverse. Bulletin 396.

M14 Series G—This is a 2 to 6 man car for light section work, including hauling of loaded trailers. May be equipped with two-speed gear for heavier duty. Bulletin 397.

M1 Series E-1 to 4 model Inspection Car with high extension lift. Load capacity is 750 lbs. Bulletin 396.

ON RAILS

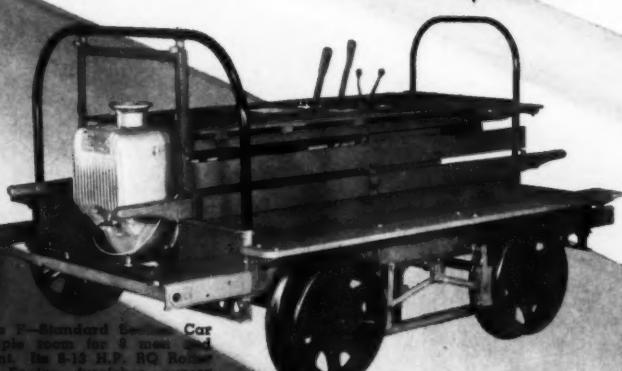
That is the big job of transportation . . . and the makers of Fairmont Railway Motor Cars accept responsibility for their contribution to this end.

The Fairmont Line is not only complete in respect that it furnishes a car for every phase of maintenance work but every car is so versatile in design and construction . . . and so surplus-powered . . . that it becomes a car of many uses. Each car is engineered for balance and lightness of weight so that it may be safely and easily handled with minimum manpower, yet always ready for its full rated quota when required.

In addition to this flexibility for broadened service and lowered costs, Fairmont provides economical operation with simple basic construction, easy access, and interchangeability of parts. Fairmont Railway Motor Cars, Inc., Fairmont, Minnesota.

Fairmont
RAILWAY MOTOR CARS

Performance
ON THE JOB
COUNTS



M1 Series E—Standard General Car with ample room for 8 men and equipment. It is 8-12 H.P. R.O. Robins Diesel Engine furnishes excess power for normal load of 1000 lbs. Bulletin 396.

W80 Series A—Derrick car having 2000 lb. load capacity, 7-ft. boom, and two speed operation. Lever controlled insulated roll clamps, full 360 degree horizontal pivot, and orientation lift. Bulletin 800 for complete details.

AND SAVING VALUABLE MAN-HOURS

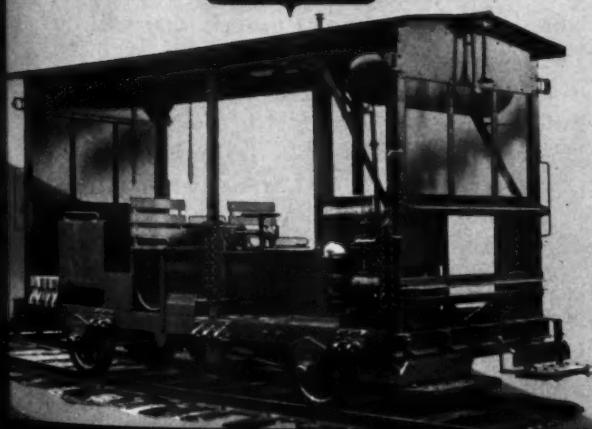
Maintenance executives, confronted with augmented work programs and handicapped by smaller crews, are becoming increasingly conscious of the important aid provided by Fairmont Work Equipment.

The proven reputation for efficiency, economy and dependability enjoyed by Fairmont work units these many years is not happenstance. The study, development and improvement of Fairmont Equipment has always been guided by the men who use the equipment and the filling of needs as outlined by maintenance executives.

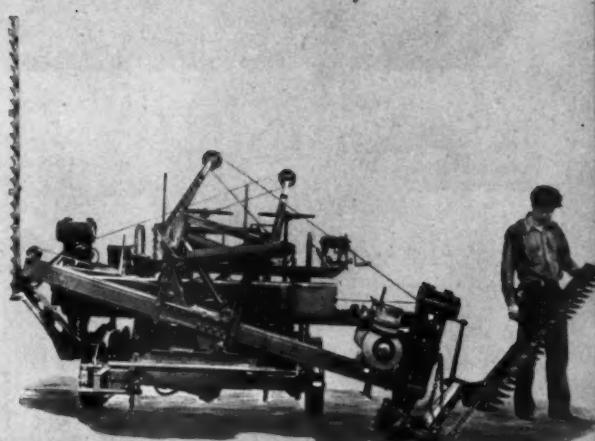
Your inquiry should be forwarded immediately as production is limited because of the war. Write for complete information. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

Fairmont
WORK EQUIPMENT

Performance
ON THE JOB
COUNTS



W55 Series A—Self propelled, open flame weed burner with five burner heads for shoulder or roadside burning to a width of 32 feet. Also available are oven type and smaller open flame burners. Write for full information.



M24 Series E—Double swath weed mower with hydraulic controls and safety snap sickles, fully adjustable for all mowing conditions. Other mowers with one or two cutter bars also manufactured. Bulletins furnished on request.

◆ M23 Series E—95 H.P. ballast drainage power unit for discing, scarring, blading; dual controls and air brakes. Smaller unit for discing only also available. Full information will be furnished promptly.

In the Shop... On the Section



A TOOL FOR EVERY JOB

You can find exactly the tool you need among the unusually wide range of large capacity Thor air drills. Drilling capacities from $\frac{1}{2}$ " to 3". Reaming and tapping capacities from $\frac{5}{16}$ " to 2 $\frac{1}{2}$ ". Speeds from 75 to 1000 RPM. Weights as low as 15 $\frac{1}{2}$ pounds.

COMPACT POWER IN HEAVY DUTY TOOLS!

• Thor Rotary Pneumatic Drills are *compactly built* and comparatively *lighter in weight* to provide easier handling both in the shop and out on the section . . . wherever a repair or maintenance job must be completed on schedule.

Thor engineers have reduced to an absolute minimum the mechanical ratios necessary to produce the heavy drilling capacity of these rugged machines. That power inside *compact* housings is available in a wide range of models that will do every operation faster.

Compact Thor construction not only provides the power for heavy capacity drilling, reaming, and tapping, but exclusive Thor design in reducing power ratios also results in low air consumption, perfect balance, lack of vibration, and governed speeds—every one a vital operating factor.

For complete details on Thor drills and other air tools, request Thor Catalog 52B.

Thor
Portable Pneumatic and Electric Tools
INDEPENDENT PNEUMATIC TOOL COMPANY



600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.
Branches in Principal Cities

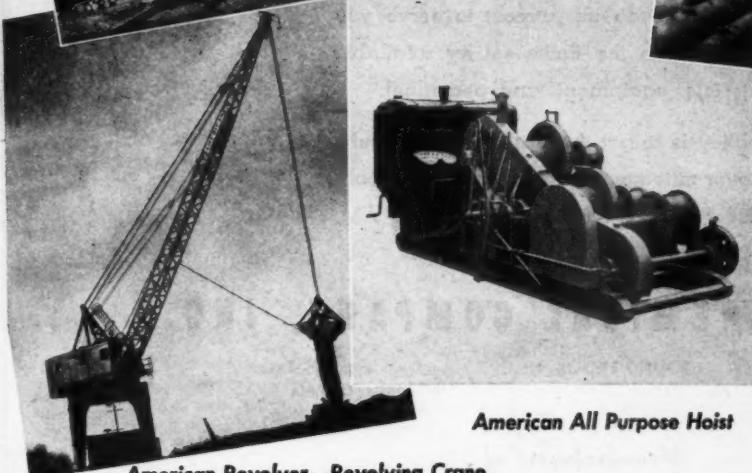
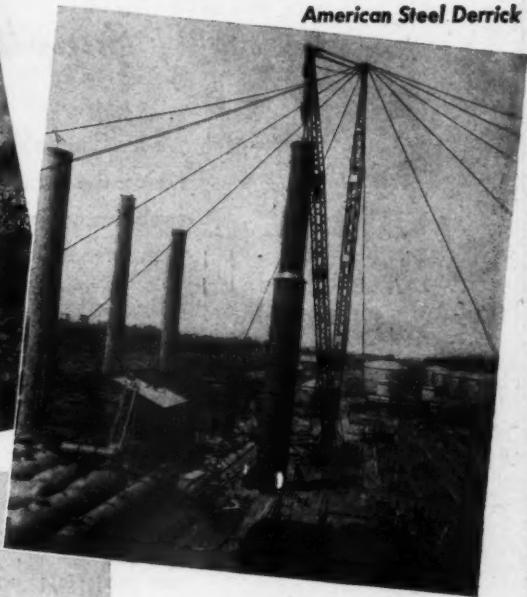
American

MATERIALS HANDLING for EVERY INDUSTRY

American Locomotive Crane



American Steel Derrick



American All Purpose Hoist

American Revolver—Revolving Crane

441

DESCRIPTIVE LITERATURE UPON REQUEST →

Plan now, but wait for *American*!



AMERICAN

AMERICAN HOIST & DERRICK CO.

SAINT PAUL 1, MINN.

CHICAGO

SAN FRANCISCO

NEW YORK

MATERIALS HANDLING
for EVERY INDUSTRY



Wherever
wire rope is fastened
... use genuine
CROSBY CLIPS
with the Red-U-Bolt

AMERICAN TERRY DERRICK COMPANY, SOUTH KOTTERY, MICHIGAN

CHEMICAL WEED CONTROL

Supplies and Policy

For labor saving and better track maintenance, the value of a consistent chemical weed control program is more fully recognized today than ever before.

Supply prospects for 1944 are greatly improved, although we are not yet able to foresee enough material to satisfy all the current increased demand.

Plan your weed control program without delay. We shall do our utmost to serve you adequately within the limits set by available raw materials, equipment, and personnel.

Our policy is to get the best possible results on whatever mileage is treated, and to use only materials of proven effectiveness.

CHIPMAN CHEMICAL COMPANY, INC.

Chicago, Ill.

No. Kansas City, Mo.

BOUND BROOK, N. J.

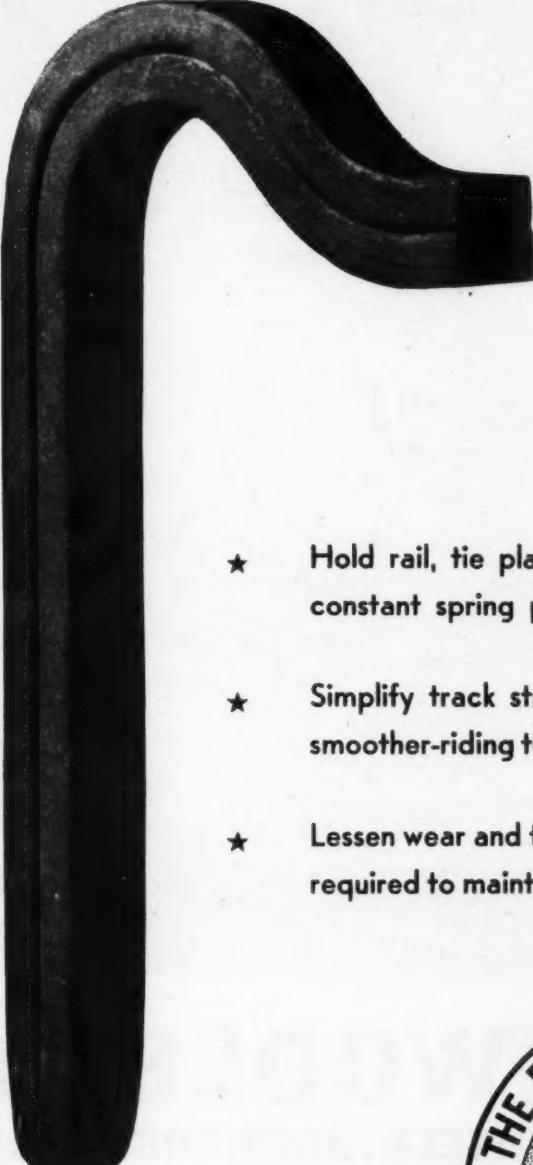
Houston, Texas

Winnipeg, Canada

Manufacturers of

ATLACIDE
CHLORATE WEED KILLER

ATLAS "A"
Chemical



Elastic

RAIL SPIKES

- ★ Hold rail, tie plate and tie firmly together under constant spring pressure, reducing rail creepage.
- ★ Simplify track structure and provide quieter and smoother-riding track.
- ★ Lessen wear and tear on ties and reduce track labor required to maintain gage, line and surface.



ELASTIC RAIL SPIKE CORPORATION

Affiliate of Bernuth, Lembcke Co., Inc.

420 LEXINGTON AVENUE

Houston

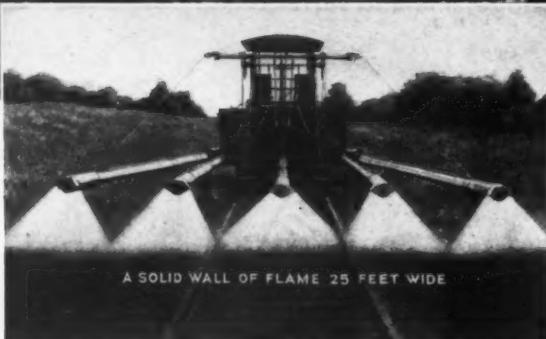
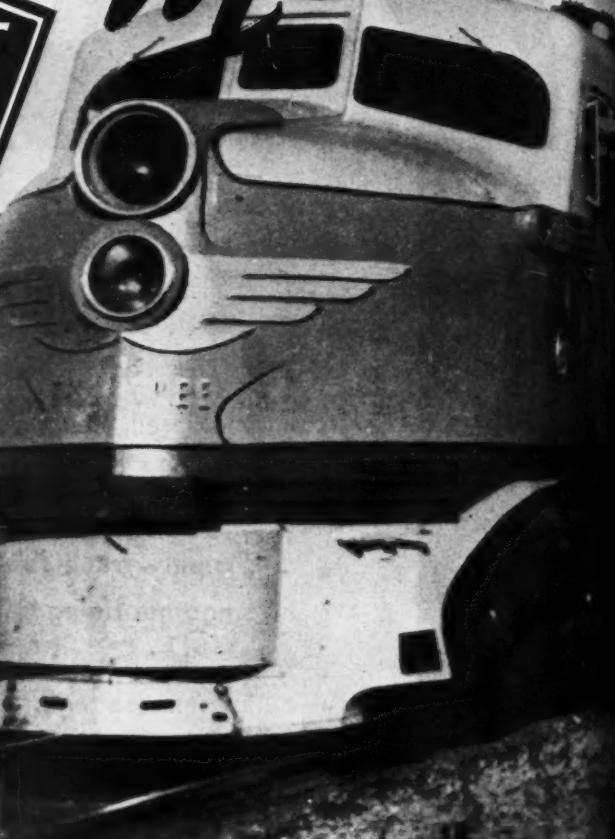
Pittsburgh

NEW YORK, N. Y.

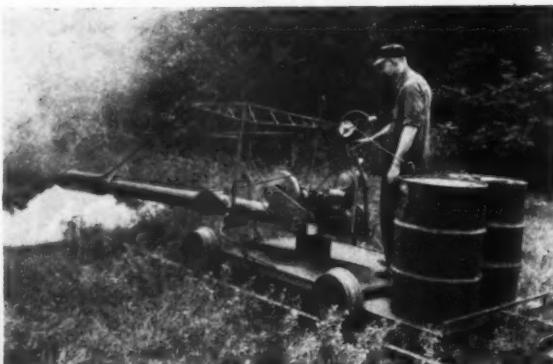
London

CHICAGO
MILWAUKEE
ST. PAUL
AND
PACIFIC

Meets



Giant Octopus Model with 5-burners—for main track.



Woolery Junior 1-burner Model for branch lines and yard.

WOOLERY WEED BURNERS Save Labor Where It Counts

On the Milwaukee Road, as on more than seventy-five other roads, Woolery Weed Burners are maintaining weed free track with minimum labor . . . convincingly demonstrating their efficiency in actual everyday use. Woolery Weed Burners are available in 5-burner, 3-burner, 2-burner and 1-burner models.

WOOLERY
PIONEER MANUFACTURERS

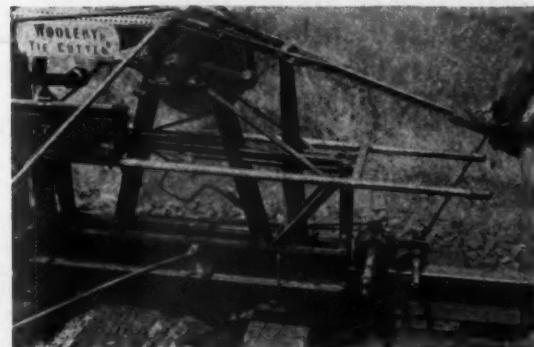
Manpower Shortage

WITH WOOLERY MAINTENANCE MACHINES

As a part of its program to utilize every available man with maximum efficiency in handling its record traffic, the Milwaukee Road is using Woolery Weed Burners and Woolery Tie Cutters to speed the completion of its track maintenance schedules with the limited forces available.



Best results are obtained when two of the Tie Cutters are used together.



With the Woolery Tie Cutter trenching is eliminated. There is minimum disturbance to ballast and surfacing is reduced one-half.

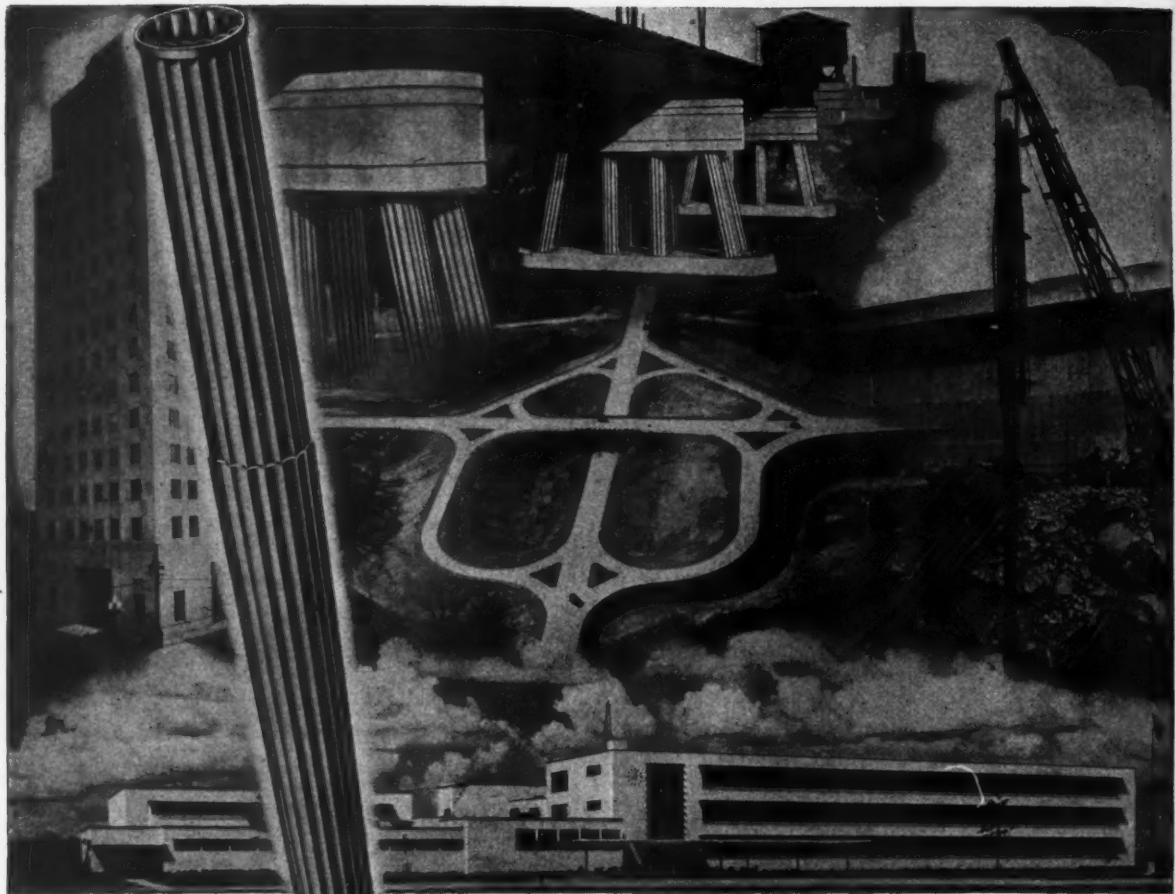
WOOLERY TIE CUTTERS Save Labor in Tie Renewals

On the Milwaukee Road, Woolery Tie Cutters are each doing the work of several men. They require only one man to operate. They saw the ties into three easily-removed pieces, leaving the tie-bed undisturbed, ready for the new tie . . . they eliminate trenching and reduce tamping to a minimum—important labor economies in these days.

Machine Company

OF RAILWAY MAINTENANCE EQUIPMENT

MINNEAPOLIS
MINNESOTA



Many of America's
Biggest Projects are
"Based" on
MONOTUBES...

NO matter what the job, Monotubes assure engineers and contractors *speed with safety* in the installation of cast-in-place concrete piling.

Sturdy and rigid, yet light in weight and easy to handle, these all-steel, tapered, fluted pile casings take much of the guesswork out of foundation construction.

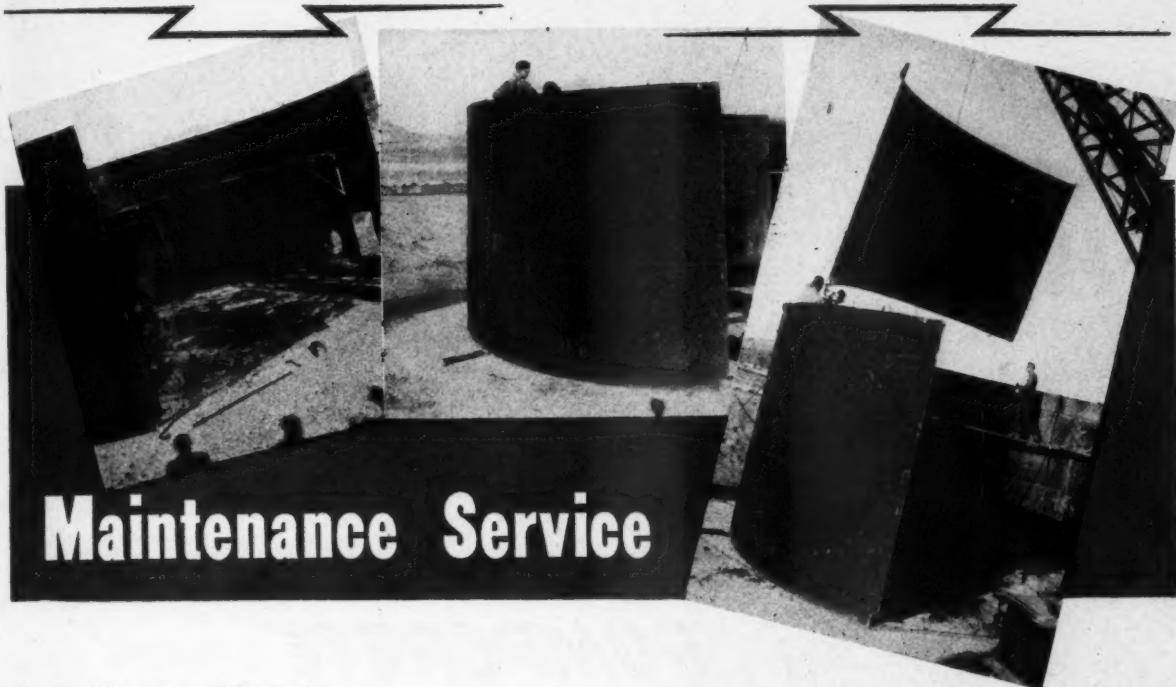
Monotubes require no heavy core or mandrel and can be driven with average job equipment; their hollow, tubular design permits easy, thorough inspection prior to concreting; and Extendible Monotubes are available for the installation of varying pile lengths.

Available now for war construction and, after the war, for *all* construction, in a gauge, size, and taper to meet all requirements. Write for Catalog 68A. The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Pile Casings

TELEWELD



Maintenance Service

Conserve Time, Men and Materials

Includes Expert Rebuilding of battered rail ends, worn frogs and switch points. Cutting down and re-erecting steel tanks. Reinforcing Steel Bridges.

To keep wartime traffic moving smoothly and to save time, man-power and materials, major railroads are today utilizing TELEWELD Maintenance Service to a greater extent than ever before.

TELEWELD, INC., offers to the maintenance official an unusually comprehensive service including a complete staff of highly trained men, especially developed machines and processes, designed to handle track and structural reclamation work, economically, thoroughly and speedily. TELEWELD operations pictured here show only a few of the many services which the Company features in its complete reclamation program. These include money- labor- and time-saving procedures designed to eliminate batter and restore worn rail to original surface; restoration of worn crossings and frogs; the dismantling and re-erecting in new locations of water and fuel oil tanks of steel construction and reinforcing steel bridges to assure many more years of usefulness.

Let us prove to you how you too can utilize your present equipment and facilities to better advantage and save time, labor and money.

TELEWELD
INC.

Welding Engineers & Contractors

Railway Exchange Bldg., Chicago, Ill.

Railway Engineering and Maintenance

Top—Left: Tank being flame-cut into Sections. Center: Sections are then Loaded into Gondola Cars and Moved to the New Site. At Right: Re-erecting the Tank.



Rail welding crew building up worn rail ends



Frog welding outfit building up worn manganese frog

...eliminate traffic delays...speed concrete placement



Concrete for this underpass crossing of the multiple tracks of the Illinois Central's system on Chicago's South Side was placed by Pumpcrete to avoid disruption of rail traffic.



...WITH PUMPCRETE

PUMPCRETE, the pump that pumps concrete through a pipe line, takes concrete placement out of the "lift and carry" method, makes it a simple pump and pipe line operation.

Regardless of the size of the job—culverts, underpasses, bridges, tunnels, snowsheds or station work—Rex Pumpcrete cuts concrete placing time and cost . . . permits more orderly, economical job progress. The Pumpcrete eliminates the necessity for erecting structures that might delay rolling stock. It simplifies placement on difficult jobs, for the Pumpcrete can pump concrete a horizontal distance of 1,200 feet or a vertical distance of 120 feet.

Proved on every type of concrete job, the Rex Pumpcrete is rapidly becoming the outstanding tool of the concrete construction industry.

SEND FOR THIS FREE BOOKLET

Whatever you want to know about the Rex Pumpcrete, this free book can tell you. Its 24 pages tell the complete story of the Pumpcrete . . . what it is and what it does. It gives you complete specifications and engineering information and many interesting installation illustrations. Send for your free copy today. Write Chain Belt Company, 1601 West Bruce Street, Milwaukee 4, Wisconsin.



REX

CONSTRUCTION MACHINERY



PUMPS



PAVERS



PUMPCRETES

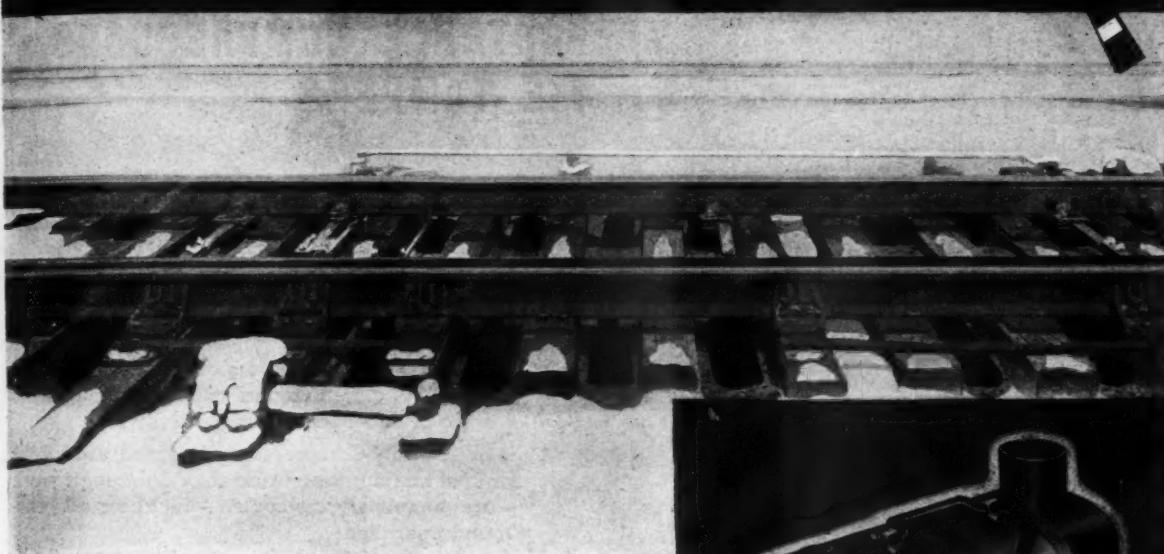


MOTO-MIXERS



MIXERS

Keep 'em rolling through ice and snow



DEPENDABLE - ECONOMICAL - SAFE

For trouble free, efficient performance Hi-Ball pre-tested switch heaters offer the quickest and surest solution to your winter switching problems. Hi-Ball switch heaters are positive in their heating action. They drastically reduce maintenance man-hours required during winter's storms. They promote safety and increase productive hours. Each unit operates 30 to 40 hours on less than 1½ gallons of kerosene. Hi-Ball switch heaters deliver such outstanding economies that they take top rank as a "must" in standard maintenance of way appliances.

We wish to thank our many customers and friends for their continued use of our product and for their patience and co-operation when, due to difficulties created by the emergency, such as manpower shortage, scarcity of materials, etc., we were unable to give our usual prompt service.



PAT. PENDING

8 Reasons Why Pre-Tested Hi-Ball Switch Heaters are Preferred

- More Economical Installation
- Lower Maintenance
- Lower Fuel Consumption
- Eliminate Fire Hazards
- Prevent Flame Blowouts
- Control Application of Heat
- Self-Contained Unit
- Serviced During Daylight Hours

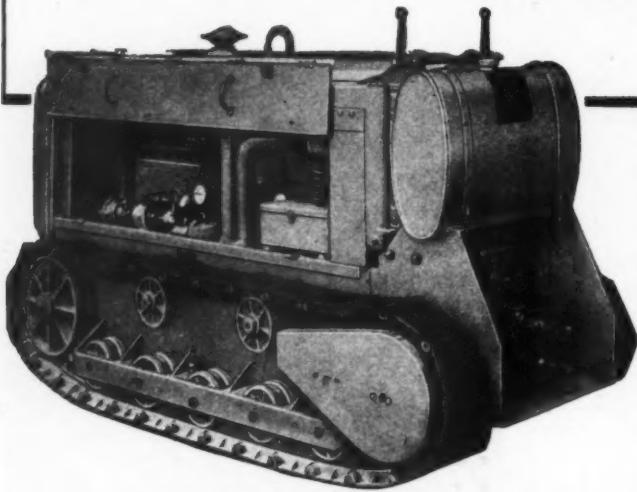
MISSISSIPPI SUPPLY COMPANY

RAILWAY EXCHANGE BLDG. CHICAGO, ILL.

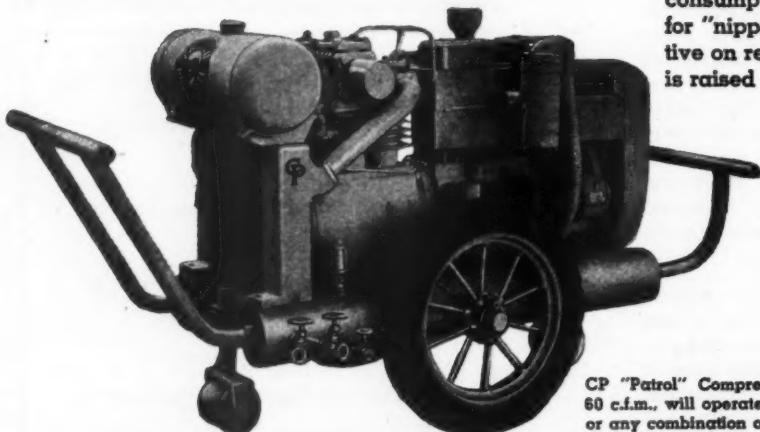


A TEAM that beats the labor shortage...

CP PORTABLE COMPRESSORS CP TIE TAMPERS

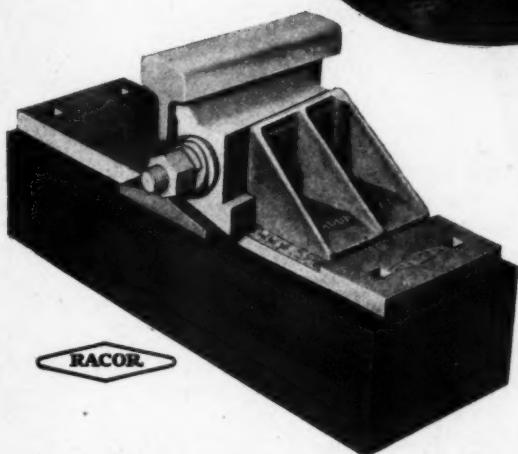


CP Crawler Compressor propels itself in either direction, travels between or across rails, turns around on its own center, will not tip over at a 45° angle.



CP "Patrol" Compressor, actual capacity, 60 c.f.m., will operate four CP Tie Tamers, or any combination of tools of equal rating.

**CHECK SIDE THRUST
AT SWITCHES**



**WITH
RACOR
ADJUSTABLE RAIL BRACES**



SIDE thrust at switches — tending to loosen and overturn rails — can be completely checked by the use of Racor Adjustable Rail Braces. Important too, is their elimination of all lost motion and resultant wear by a firmly-fitting wedge between backer and rail section that prevents any play.

Well designed and readily adjustable, these braces "stay put" once adjusted — providing a solid backing for interlocked switches of even the heaviest type. You obtain the maximum degree of security when you use Racor Adjustable Rail Braces to hold rails. Write for further details . . . or talk it over with our representative.

THESE ARE THE DESIGN FEATURES:

- Large backer securely attached to plate
- Contacting faces of wedge and backer machined to an accurate fit
- Can be used on all heavy service switches

THESE ARE THE OPERATING FEATURES:

- Stock rail will not tilt during tightening
- Eliminates play, lost motion and wear of interlocked switches
- Checks side thrust
- Easily and quickly adjusted
- "Stays put," once adjusted

Brake Shoe

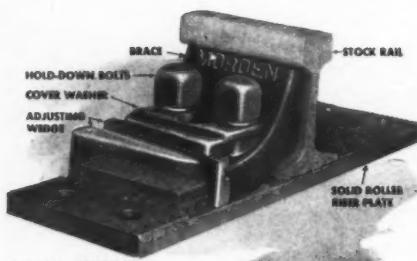
RAMAPO AJAX DIVISION • 230 PARK AVE., NEW YORK 17, N.Y.

HILLBURN, N.Y. • NIAGARA FALLS, N.Y. • CHICAGO, ILL.

EAST ST. LOUIS, ILL. • PUEBLO, COLO. • SUPERIOR, WIS.

LOS ANGELES, CALIF. • SEATTLE, WASH. • NIAGARA FALLS, ONTARIO No. 3522

Morden Security Adjustable Rail Brace

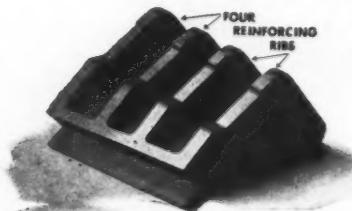


Pat. No. 2250891

COMPLETE BRACE ASSEMBLY



INDIVIDUAL PARTS OF BRACE



UNDER SIDE OF BRACE

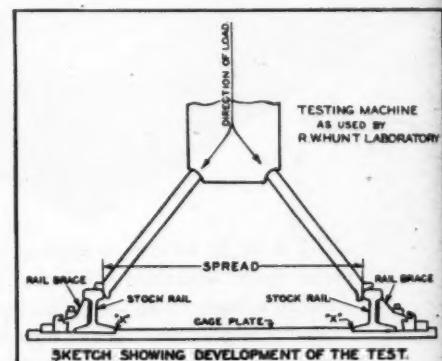
Four reinforcing vertical ribs, which extend from rail web to floor of brace plate, afford the greatest possible structural strength to the design.

1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944
PROGRESSIVE DEMAND FOR MORDEN SECURITY ADJUSTABLE RAIL BRACES

Feb. 19
1944
1943
1942
1941
1940
1939
1938
1937
1936
1935
1934
1933
1932

The improved Morden Security Brace is specially designed to meet the needs of wartime traffic by providing adequate support for rails subjected to the thrust of heavy wheel loads. The Brace is adapted particularly for use in split switches and slip switches in interlocked territory where it is essential to hold stock rails to proper gage and alignment.

Simple in design, the Brace can be quickly installed, adjusted or removed, without disturbing either rail, tie or plate. Rigorous loading tests have shown that the Security Brace will support a weight of 50,000 lb. at a 45 deg. angle, with a spread of only $\frac{1}{8}$ in., and a spread of only one inch when this weight is raised to 200,000 lb.



SKETCH SHOWING DEVELOPMENT OF THE TEST.

For more than 60 years Morden has pioneered in the construction of frogs, switches, crossings, guard rails, gage rods, rail braces and security track work. Let our engineers help you solve your track maintenance problems.

Morden Frog and Crossing Works CHICAGO, ILL.

Representatives in: CLEVELAND, OHIO; NEW ORLEANS, LA.; LOUISVILLE, KY.; ST. LOUIS, MO.; WASHINGTON, D. C.

1944

NATIONAL
RAILWAY
APPLIANCES
ASSH.

A Message from Our Members

THE National Railway Appliances Association extends to the American Railway Engineering Association its warmest greetings and hearty congratulations. The demands of the War Effort with its new and ever increasing problems make your continued deliberations imperative, and your re-

solution to resume your meetings this year is most commendable.

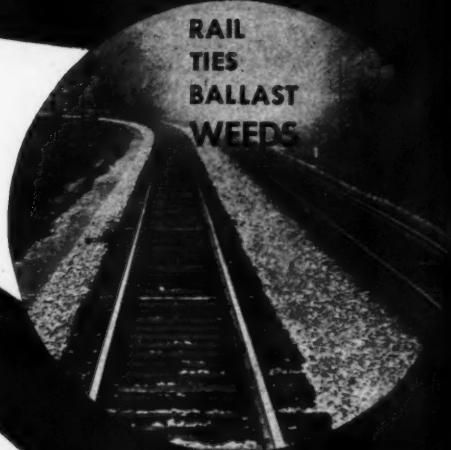
Our Association believes that at this time, and consistent with the War Effort, in which its members are deeply engrossed, it can best serve you out on the line, and trusts, it can best serve you permit a resumption of its Exhibitions.

NATIONAL RAILWAY APPLIANCES ASSOCIATION
208 South LaSalle Street,
Chicago 4, Illinois

We, As Members, Feel That Your Problems Are Our Problems and Stand Ever Ready to Assist You

The Adams & Westlake Company
Air Reduction Sales Company
American Car & Foundry Company
The American Fork & Hoe Company
American Hoist & Derrick Company
American Nut & Bolt Fastener Co.
Armed Railroad Sales Co.
The Austin-Western Company
Barre Manufacturing Co.
Bethlehem Steel Company
The Buda Company
Caterpillar Tractor Co.
Chicago Pneumatic Tool Company
Chippman Chemical Company
Cleveland Fog & Crossing Co.
The Howard P. Clegg Co.
Crerar, Adams & Co.
Cullen-Frosted Company
Dearborn Chemical Company
A. P. deGraauw & Son, Inc.
Paul Dickinson, Inc.
The Duff-Norton Manufacturing Co.
Eaton Manufacturing Co., Spring Washer Div.
Elastic Rail Spike Corporation
Electric Tamper & Equipment Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Fog Switch & Manufacturing Co.
Gary Screw & Bolt Company
General Electric Company
Homelite Corporation
Hubbard and Company
Industrial Brownhoist Corporation
Imperial-Rand
Inland Steel Company
Johns-Manville Sales Corporation
O. F. Jordan Company
Kalamazoo Railway Supply Co.
The Karite Insulated Wire & Cable Co.
The Lahan Company
Lewis Bolt & Nut Company
The Lundie Engineering Corporation
Magnusflux Corporation
Maintenance Equipment Co.
Mail Tool Company
Massey Concrete Products Co.
The Master Builders Co.
Metal & Thermite Corporation
Mardon Fog and Crossing Works
Morrissey Railway Supply Corporation
The Murdock Mfg. & Supply Co.
National Aluminite Corporation
National Lead Company
The National Lock Washer Company
The Nichols Engineering Co.
Nordberg Manufacturing Co.
Northwestern Motor Company
The Ozwald Railroad Service Company
The P. & M. Company
Pettibone Mulliken Corporation
Pittsburgh Pipe Cleaner Co.
Philadelphia Steel & Wire Corporation
The Pocket List of Railroad Officials
Positive Rail Anchor Co.
The Pyle-National Company
The Q and C Co.
The Rail Joint Company
Railroad Accessories Corporation
Railroad Products Company
The Rail Company
Railway Maintenance Corporation
Railway Purchases and Stores
Railway Track-Work Company
Rampage Ajax Div. American Brake Shoe Co.
Republic Steel Corporation
Rust-Oleum Paint Corporation
Simmons-Boardman Publishing Corporation
T. W. Snow Construction Co.
Stanley Electric Tool Div. The Stanley Works
Sytron Company
Taylor-Wharton Iron & Steel Co.
Teleweld, Inc.
Templite, Knly & Co.
Union Switch & Signal Co.
Unit Rail Anchor Company, Inc.
United States Steel Corporation
United States Engine & Pump Co.
Warren Tool Company
Western Railroad Supply Company
Westinghouse Electric & Mfg. Co.
Welding-Verso Tool Works
Wheeler Machine Co.
Youngstown Sheet & Tube Co.

THE MAINTENANCE ENGINEER PONDERS



THIS ENGINEER knows how heavy weed growth demoralizes track forces. He is up against labor shortage for even essential track work.

He knows most of the large systems treat thousands of miles of track with weed killer and clean up the job in a few weeks' time.

THE REAL TEST OF SERVICE IS PERFORMANCE UNDER DIFFICULT CONDITIONS. Many railroads in 1942 and 1943 would have had no chemical weed killer except for the resourcefulness of READE MANUFACTURING COMPANY chemists.

Let us review your weed control problem with you for 1944. The raw material situation is far better than in 1942 or 1943.

POISONOUS WEED KILLER MAY NOW DEFINITELY BE USED without risk of live stock poisoning. This is an outstanding contribution to the art of weed control which will be of great benefit to all railroads.

Reade Manufacturing Company, Jersey City, N.J.
Plants at five railroad centers.

PRODUCING BALLAST AT RAILSIDE PITS

Saves ton-miles in hauling



Because of the record volume of war-time traffic, the shortage of cars and labor, railroads are faced with new ballast problems. They must secure more and better ballast, at lower costs, with shorter hauls and speed up ballasting operations.

The answer to these new demands was found by one railroad by producing ballast at railside pits with a portable plant.

A Pioneer Portable plant was selected by the contractor E. W. Wylie Co., Inc., of St. Paul. It meets all the requirements of the job. It is easily moved to railside pits. It is producing approximately 125 yards of ballast per hour from pits containing 40% oversize. The railroad is receiving a better quality of ballast, at a saving over the cost of commercial gravel, plus savings in rail haul and use of cars.

This Pioneer Portable ballast plant consists of a loading hopper equipped with mechanical feeder, a 1536 primary jaw crusher and power unit mounted on truck and a 38 V Pioneer crushing, screening, loading plant mounted on a railroad flat car. A belt conveyor loads a gondola on parallel track every 17 minutes. In moving from one pit to another, the primary crusher and the conveyors are loaded on another flat car.

The E. W. Wylie Company is equipped for modern methods of producing ballast through wide flexibility of operation. Because their Pioneer plant is readily portable it is moved easily to various pits each accessible to ballasting operations—and because the plant is a Pioneer they can produce any size or variation of crushed product at the lowest dollar cost.

Pioneer equipment is profit-making equipment because it is engineered to meet your requirements for either a specific application or a wide range of work. It is durable equipment built to function with a minimum of maintenance. Planning with Pioneer involves no obligation. Regard its complete service as an ally of your business which is always available. Detailed literature on any Pioneer products furnished promptly.



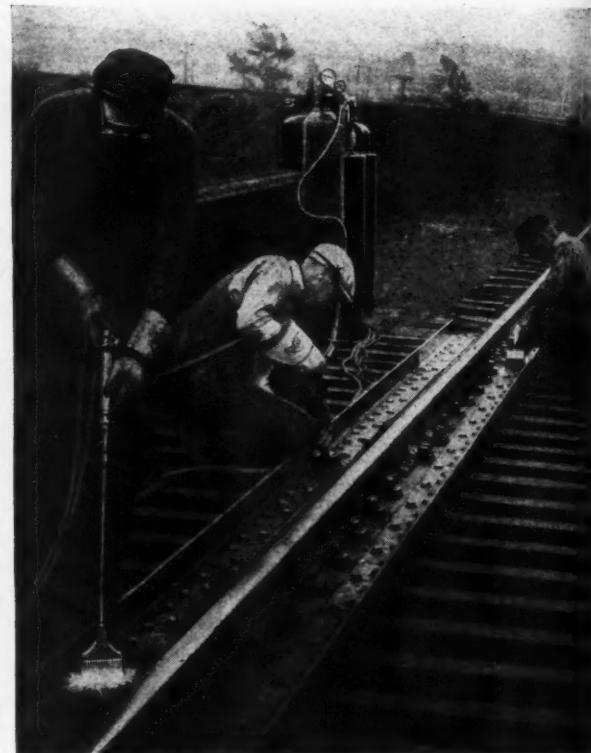
Oxweld Railroad Service

Today . . .



OXY-ACETYLENE END-HARDENING

Rail-end hardening by Oxweld's method lengthens the life of rail in first position by increasing the hardness of the rail right at the point of batter. This flame-treatment not only conserves rail by retarding batter, but by so doing reduces wear on joint bars and bolts. By specifying Oxweld's end-hardening when new rail is laid, railroads can make substantial savings in time and materials.



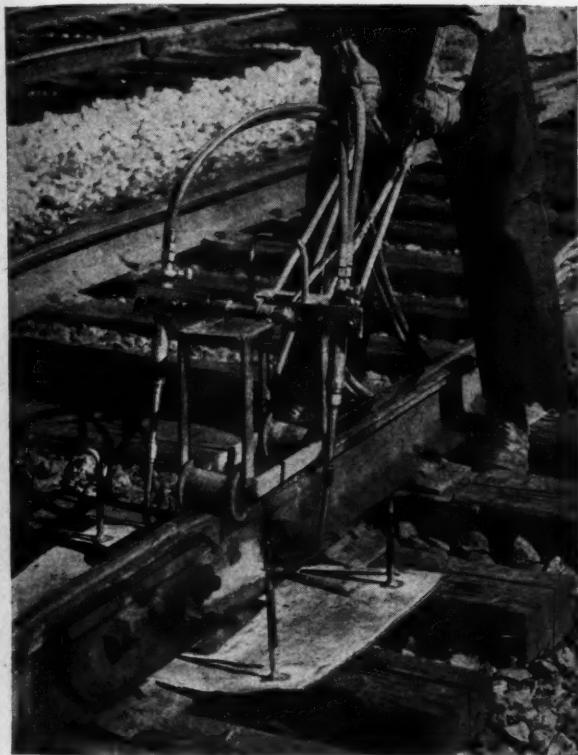
OXY-ACETYLENE FLAME-CLEANING

Flame-cleaning is an economical way to start a long-lasting paint job on steel structures. The oxy-acetylene flame causes residual paint and rust to pop off quickly. Then wire brushing and painting should follow immediately while the surface is warm and dry. This eliminates the major cause of subsequent corrosion, for paint spreads evenly and bonds tightly when applied to a warm, dry surface.



— BUY UNITED STATES WAR

retards Tomorrow's Wear



FLAME-STRAIGHTENING JOINT BARS

Worn joint bars, which permit sag at rail joints and intensify the effects of rail-end batter, can be straightened by localized heating, cooling, and contraction. Oxweld's semimechanized method of flame-straightening requires only one operator. It prolongs the life of the joint bars, provides a more nearly true riding surface, and cuts down the amount of welding required for building up rail ends.

Many future maintenance problems can be anticipated . . . and prevented . . . by applying Oxweld's wear-retarding processes today. For example, the destructive effects of rail-end batter can be minimized in advance by mechanized oxy-acetylene hardening of rail ends.

The Oxweld processes illustrated and explained here are worthy of your *particular* attention *today*, when new materials are hard to get, when experienced track crews are scarce, and when wear is intensified by heavier trains and more of them. Why not review these processes to see how they can simplify your maintenance program? Or ask an Oxweld representative—he will be glad to advise you how to use them effectively.

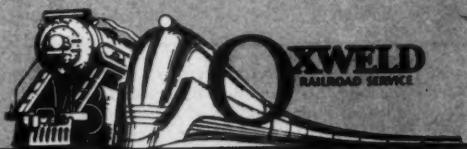
BONDS AND STAMPS

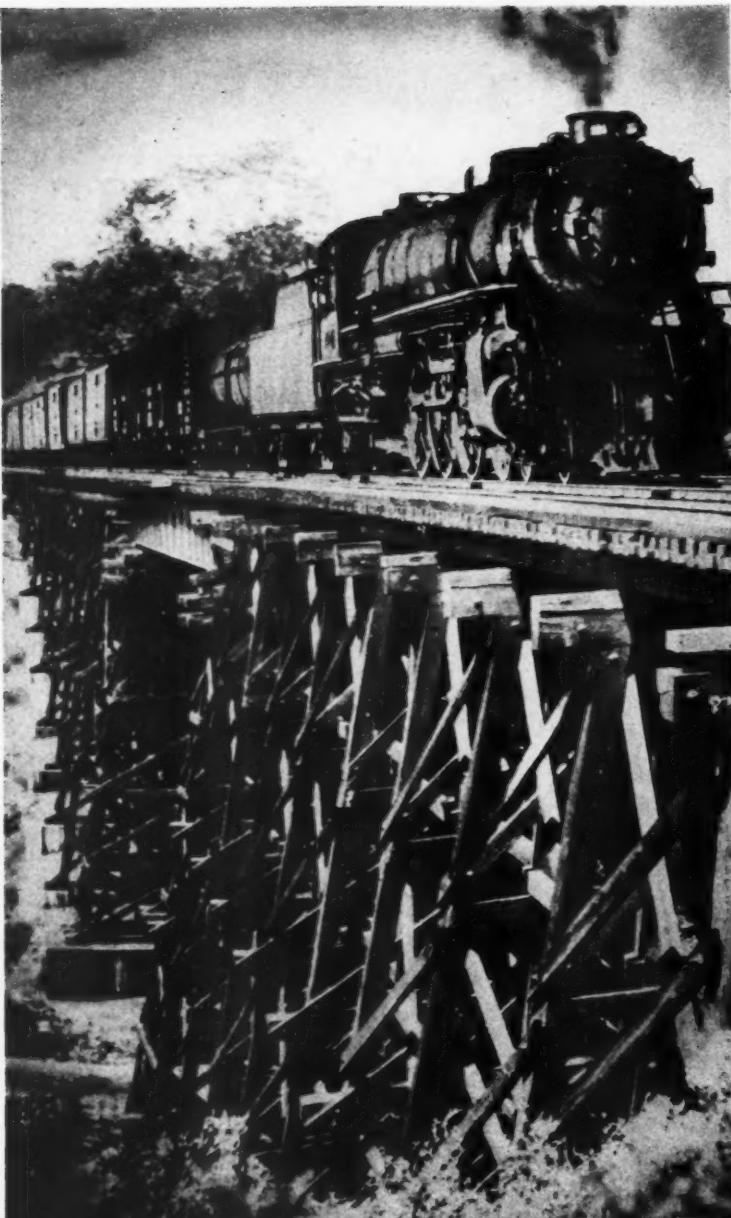
THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

Carbide and Carbon Building Chicago and New York





Heavy Duty TIMBER CONSTRUCTION For RAILROADS

More than 70 railroads in America are now using timber and Teco Connectors for practically every type of railway structure.

The Teco System of Timber Construction offers greater strength and rigidity, economy, and longer life with lower maintenance costs. These advantages are yours—now and in peacetime. Write today for our free literature.

TIMBER ENGINEERING COMPANY

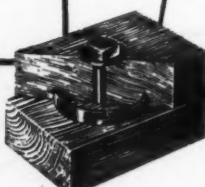
National Manufacturers of
TECO Timber Connectors

Washington Chicago Minneapolis
New Orleans Portland

TYPES OF RAILWAY STRUCTURES USING TECO TIMBER CONNECTORS:

- 1. Roof Trusses
- 2. Overhead Cranes
- 3. Timber Bents
- 4. Connections between pile heads and caps.
- 5. Trestles
- 6. Ballast deck stub piles
- 7. Piers
- 8. Pier Fenders
- 9. Sway Bracing
- 10. Coal Pockets
- 11. Auto Loading Dock
- 12. Between Rail Post and Tie Connections
- 13. Bridge Decks
- 14. Scaffolding
- 15. Coaling Towers
- 16. Warehouses

The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood... brings the full structural strength of lumber into play.



Specify
TECO
CONNECTORS AND TOOLS

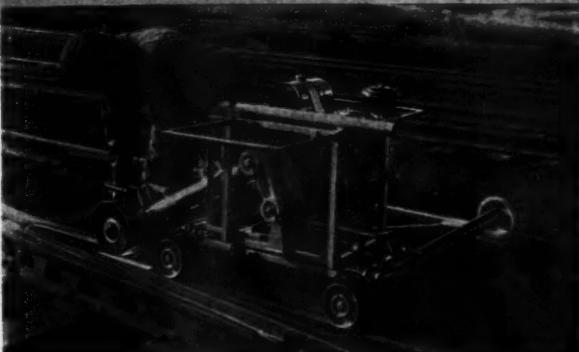
Endorsed by Leading Lumber Manufacturers and Fabricators

TECO Grooving Tools are manufactured exclusively by Greenlee Brothers and Company—one of the world's largest manufacturers of wood-working tools.



Many Rail Grinding Jobs Can Be Done **FASTER and BETTER** with this **FLEXIBLE ARM GRINDER**

Removing flow at switches and stock rails.
Note that operator stands erect while at work.



Grinding frogs and flangeways.



Slotting rail ends.



Equipped with power take-off and flexible
shaft for off-track service.

This is the most convenient grinder ever offered for removing flow at switch points and stock rails, rail end slotting, grinding frogs, flangeways and crossings, and undercutting the stock rail to house the switch point. When supplied with power take-off and flexible shaft it can also be used with a wide variety of Nordberg grinding accessories. Its simplicity, ease of handling, fast cutting and ample power make this grinder applicable to many grinding jobs. For better maintained track at less expense, investigate the merits of this many purpose Flexible Arm Grinder.

There is a Nordberg Power Tool for Your Maintenance Jobs

Adzing Machine

Spike Puller

Power Wrench

Power Jack

Rail Drill

Track Shifter

Five Rail Grinders



NORDBERG MFG. CO.

MILWAUKEE 7, WIS.

Export Representative

WONHAM, Inc., 44 Whitehall St., New York, 4



Photo Courtesy Louisville & Nashville R. R.

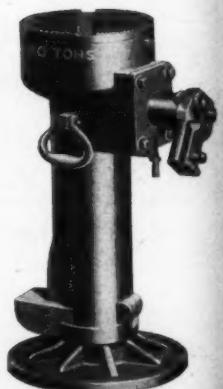
Duff-Norton Jacks

provide "experienced helpers" on bridges and structures as well as track work.



Duff-Norton Jacks are your best bet for speed, power and long service life! These husky Jacks help with the work all along the way, from track work to your bridge and structure maintenance.

Use Duff-Norton Jacks . . . they're "mechanical muscles—experienced helpers" for your crews. Catalog 202 on request.



The
DUFF-NORTON MANUFACTURING COMPANY
 PITTSBURGH, PENNSYLVANIA
 Canadian Plant: Coaticook, Quebec
 Representatives in Principal Cities



LeTourneau Carryall Scraper and "Caterpillar" track-type tractor construct a railroad grade leading into new blast furnace of the American Rolling Mill at Ashland, Ky.—fast, economical, hauling-loading-spreading in one off-track operation.

WITH LeTOURNEAU EARTHMOVING EQUIPMENT

You Can Repair and Maintain Railroad Grades Without Interrupting Traffic

WORKS OFF-TRACK . . . NO
BIG CREWS OR WORK
TRAINS NEEDED . . . MAKES
50 TO 60 MINUTES OF EVERY
WORK HOUR PRODUCTIVE

Alert railroad managers, superintendents, construction engineers and maintenance foremen like these many money-saving, job-proved advantages of LeTourneau Carryall Scrapers, Dozers, Cranes and Rooters, for handling right-of-way construction and maintenance:

1. Works off-track, thus keeps revenue trains rolling; eliminates switching or need for temporary spur tracks; makes 50 to 60 minutes of every work hour productive.

2. One-man operated, thus solves today's manpower problem and eliminates expensive work trains.

3. Saves on equipment investment—same tractor operates Carryall Scraper, Dozer, Crane and Rooter. Change from one unit to another easily and quickly made.

4. More flexible—not restricted by narrow rights-of-way, low signal or telegraph wires or other railroad structures—readily accessible for work impossible to rail-bound equipment.

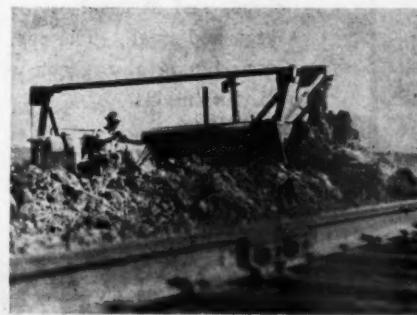
5. Long life and low operating and maintenance cost—most repairs can be made in field with your welding outfit.

HAS MANY USES

Here are a few of the practical, proven uses you'll find for rugged LeTourneau units—try them yourself—see how you can cut costs and speed up your railroad jobs:

1. New grade construction.
2. Relocating grades and alignment.
3. Strengthening slope shoulders.
4. Digging and cleaning drainage ditches.
5. Shaping banks and slopes to eliminate snow traps.
6. Snow removal.
7. Moving and shifting tracks.
8. Removing slides and wash-out materials.
9. Off-track work around wrecks.
10. Placing bridge members, pipe, etc.
11. Loading and unloading cars.

Once you've tried a Scraper and Dozer on your roadway, you'll agree with other successful railroad operators that there's no longer any need for heavier, more expensive, on-track equipment, large crews, high-cost work trains, switching, traffic delays or spur tracks—the LeTourneau way is the fast, money-saving, efficient way!



LeTourneau Bulldozer and "Caterpillar" D-8 tractor cut right-of-way along railroad to reinforce roadbed, at same time buries dried grass to eliminate fire hazard.

Used by Leading Railroads—At Home and Abroad

United States

Chicago, St. Paul, Minneapolis & Omaha.
Great Northern Railway Co.
Northern Pacific.
Minneapolis & St. Louis.
Minneapolis, St. Paul, Sault Ste. Marie.
Southern Pacific.
Southern.

Central and South America

Ferrocarriles Nacionales de Mexico.
Ferrocarril del Pacifico de Nicaragua.
Int'l Railways of Central America
(Guatemala).
Tela Railroad Co. (Honduras).
Maderia-Mamore Railway (Brazil).
Araraquara Railroad (Brazil).

Africa

Trans-Saharan Railway.

Middle East

Iraq Railway Co. (Iraq).

LETOURNEAU
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

For more information, fill in this coupon and mail TODAY.

R. G. LeTourneau, Inc.
Dept. REM-344.
Peoria, Ill.

I would like to have:

Industrial Folder No. A-284, describing railroad applications.
 More information about your Field Engineering Service, for aid on my special problems.

Name _____

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Saving
TIME
LABOR
MONEY

For complete details and plan of this installation, write for Bulletin 1053.

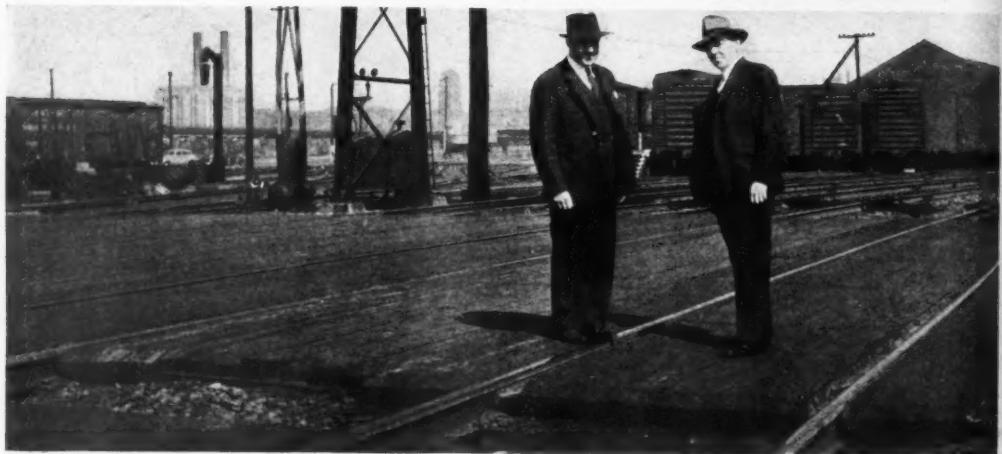
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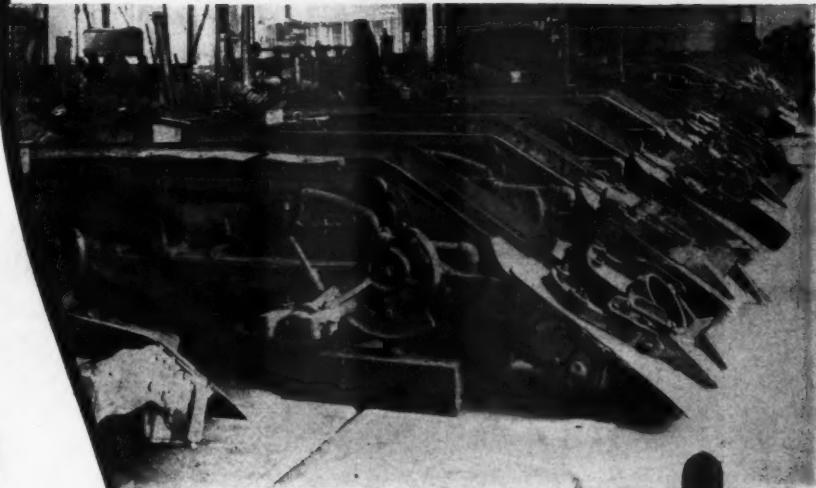
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**WELDING,
BRAZING
AND
HARD-
FACING**



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Representatives of Air Reduction's Applied Engineering Field Service will be glad to help you obtain the maximum efficiency and economy from the use of these methods.

Call or write the nearest Air Reduction office.



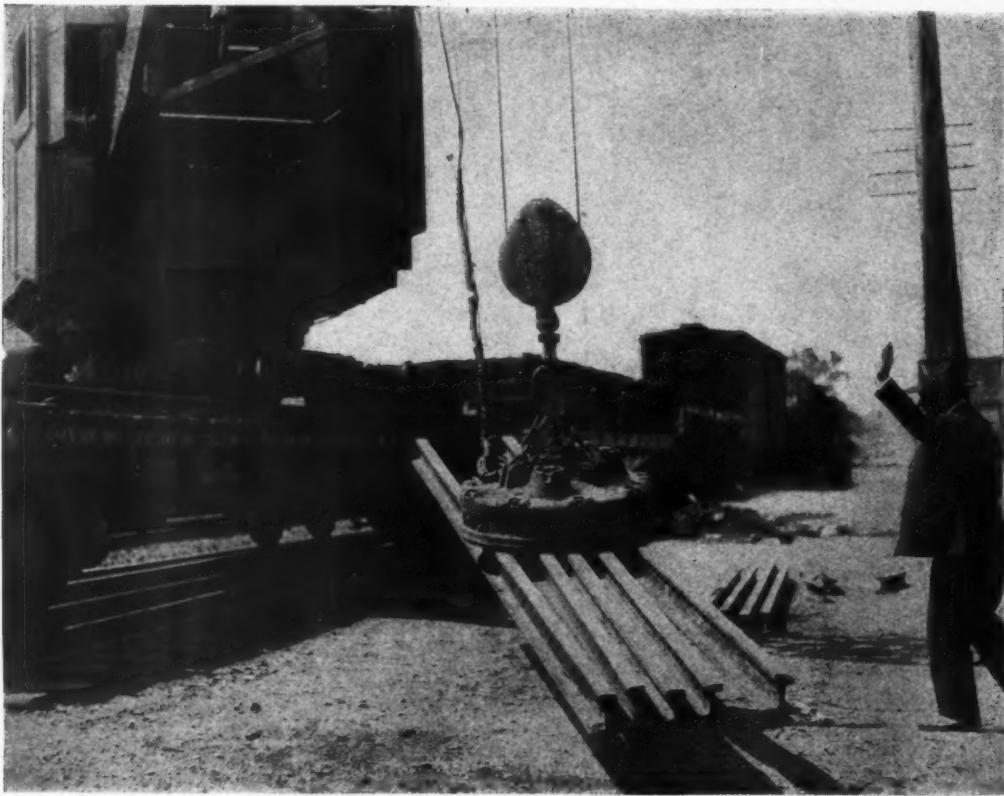
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Why not include this modern method of handling rail and fittings in your efforts to secure economy and efficiency in your maintenance and construction work?

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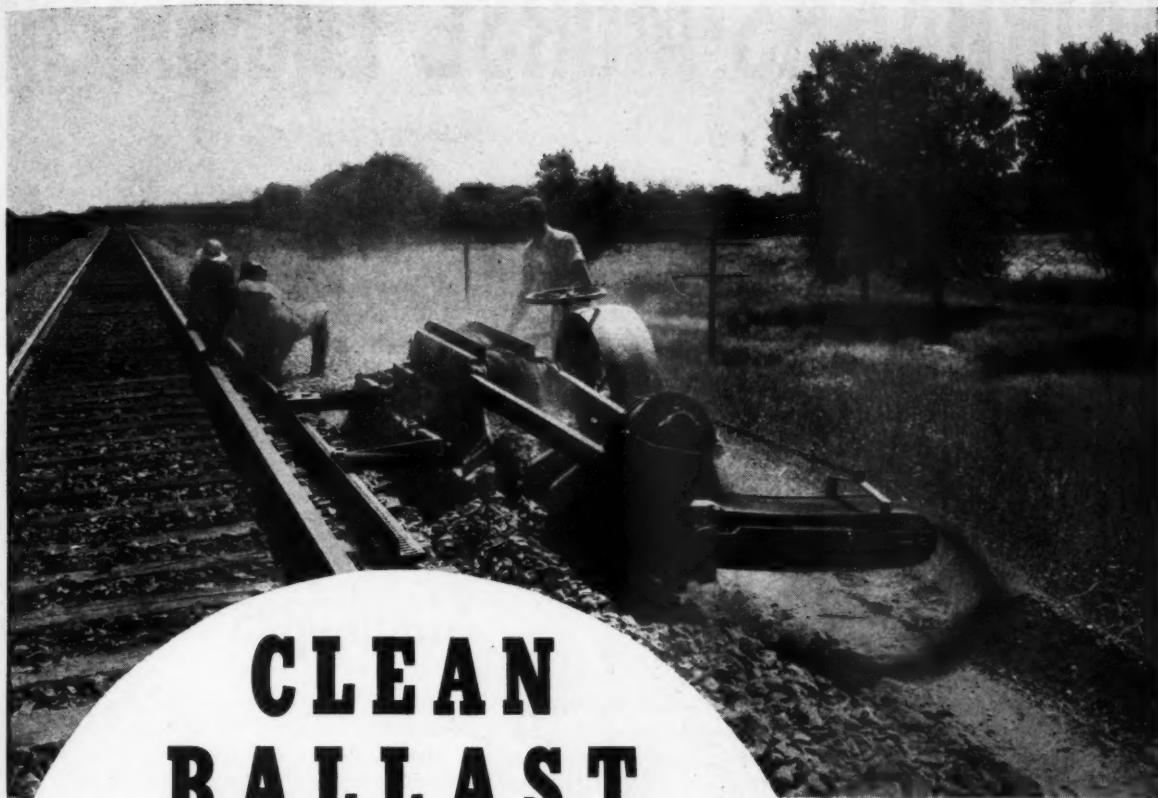
214

March, 1944

Cleveland 4, Ohio

Railway Engineering and Maintenance

Efficient Operation Demands Good Track



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Is Essential To the Maintenance of Line and Surface

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RAILWAY MAINTENANCE CORPORATION

PITTSBURGH 30

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THREE is no industry facing problems more critical than those of the railroad industry.

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Modern railroad operation demands standpipes with fast valve action, positive operation, large capacity, rugged construction, accessibility of parts, and other features that are built into Sheffield Standpipes.

Illustration shows Sheffield #12A Standpipe with telescopic spout which gives wide lateral and vertical range...convenient levers that permit rotation, from ground

or tender...operating rods that are easily adjustable...springs to eliminate shock...large roller that steadies spout...all rods outside of pipe, for easy adjustment.

In addition, this standpipe automatically locks from ground or tender...has no cable sheaves to clog with ice...rotates easily. Made in 8", 10" and 12" size—capacities up to 6000 g.p.m.

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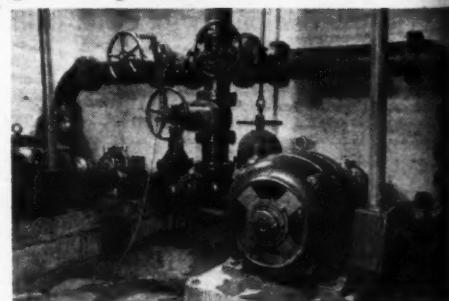
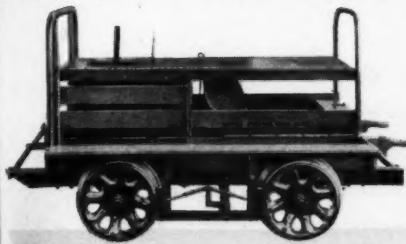


Illustration shows Fairbanks-Morse Pumping Equipment installed by Clinchfield Railroad. Here, two 3-in. Fairbanks-Morse (Figure 5874) Centrifugal Pumps rated 500 g.p.m. at 252-ft. head are direct-connected 3600 r.p.m. Type QS Fairbanks-Morse Motors.

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ECLIPSE MODEL 785—Similar to *Sheffield 85*, but belt-driven.



SHEFFIELD MODEL 44B—The standard section car on many railroads. Sturdy, roomy. Weighs 1095 pounds. Has ample power to haul trailers loaded with men, tools or ties. Water-cooled 8- to 13-hp. engine with air-cooled head. Chain drive.



NEW FAIRBANKS-MORSE VICTORY MODEL 57—The one-man inspection car, easily handled by one man alone. Has dependable 9-hp. water-cooled engine. Equipped with clutch and roller chain transmission.



NEW FAIRBANKS-MORSE VICTORY MODEL 757—Inspection car is similar to *Model 57*, but belt driven.



SHEFFIELD MODEL 40-B—One of the finest heavy-duty motor cars on rails. Has powerful engine—weights 1235 pounds—ample room for section gangs. Has 4 speeds forward and reverse, with more than enough power to haul trailers.



SHEFFIELD MODEL 54B—Inspection car for from 1 to 4 men. Has 5- to 8-hp. water-cooled engine—self-centering powerful brakes, wood center wheels, adjustable rear axle box—and is chain-driven. *Model 754B* is belt-driven.



SHEFFIELD MODEL 709—Lightweight Standard Section car similar to *Model 53*, but with belt drive.



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MAXIMUM STRENGTH

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A NATIONAL ORGANIZATION
SPECIALIZING EXCLUSIVELY IN SHOVELS, SPADES AND SCOOPS

Railroad Men Prefer



VERONA



**Fixed Tension
Triflex Spring**

**HIGHEST
REACTIVE
SPRING PRESSURE**

**MORE THAN
2 1/2 TIMES
A.R.E.A. Requirements**



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Securely grips, lifts
and holds ties for
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Rail Bender —
Bends all "T" rails
up to 151 lb. without
heat.

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helps small crews do big jobs efficiently

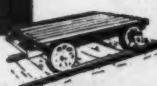
Track Liner —
Three men align more
rail than 11 men with
aligning bars.

Track Jacks —
Sturdy, durable jacks
in many models speed
up maintenance jobs.



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Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Twenty-Six Years of
Equipment Economies

March 1, 1944

Dear Reader:

Twenty-six years ago we brought to you our first Equipment Economics issue. Annually thereafter we have given special attention to the mechanization of maintenance of way work in this March issue. In this period of more than a quarter of a century, this issue has won a large place in your interest and in that of those companies which are building the equipment you use.

The development of work equipment has made spectacular progress in recent years, both in its design to meet the widely diversified needs of the railways and in its utilization by the railways. For both of these advances, we believe that we may, with due modesty, claim some credit, for, issue after issue through these years, we have brought to you the discoveries of builders and users and in these annual issues each March we have thrown the full glare of the spotlight on this phase of maintenance progress.

Through this continued emphasis on mechanization, we believe that we have served the railways and their maintenance forces alike. For the railways, work equipment has made possible more uniform and lasting works; it has made possible large economies in the conduct of the work and has thus released money to undertake still other work which could not otherwise have been undertaken. Even more vital, the availability of equipment has made possible the prosecution of programs in periods of acute shortages of labor, like that now prevailing, which would not otherwise be possible in any other way, and has thus contributed to the continuity of transportation.

Equally and possibly even more striking have been the contributions to labor. Early feared as a means for depriving men of work, this equipment is today widely recognized as a great boon to the workman. First of all, it relieves him of much of the drudgery that formerly attached to his work. What trackman would return to the hand car, to the hand shovel for ditching or to the tongs for laying rail? Power equipment has eased these burdens and made his work more pleasant and less arduous. And this equipment has so increased his output as to bring to him the highest wage he has ever received. It is significant that in this branch of railway service in which mechanization has made the greatest advance, the increase in compensation of the workmen has also been the greatest. As a result, maintenance of way work is passing rapidly from the category of unskilled to that of skilled labor.

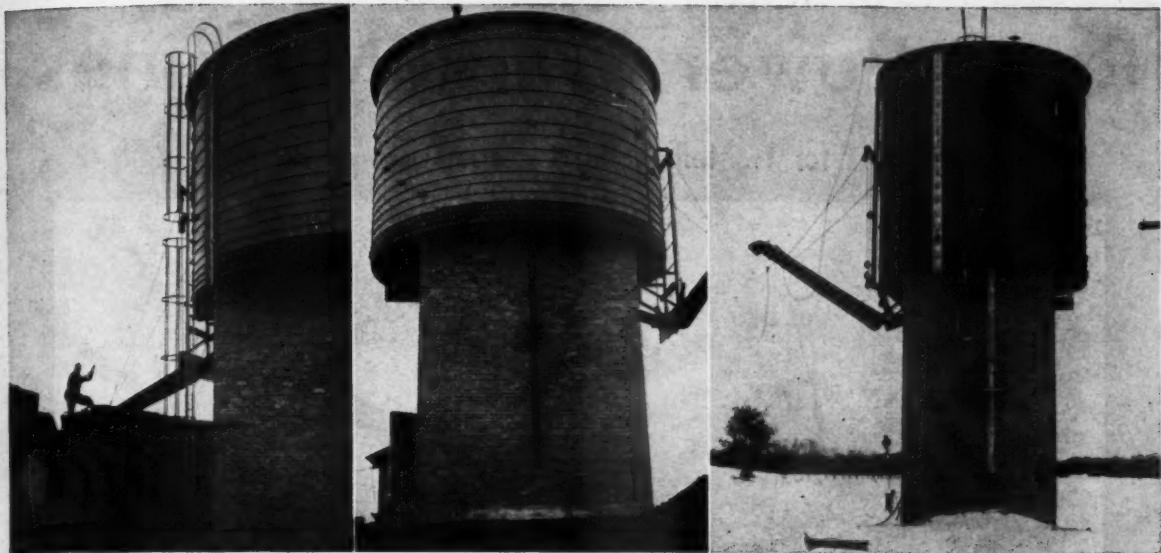
To all parties concerned, the railways, their employees and the builders of the equipment, mechanization of maintenance of way operations has been a boon. We are proud to have had a part in it. We look for still further advances in the years that are ahead.

Yours sincerely,

Elmer T. Hanson

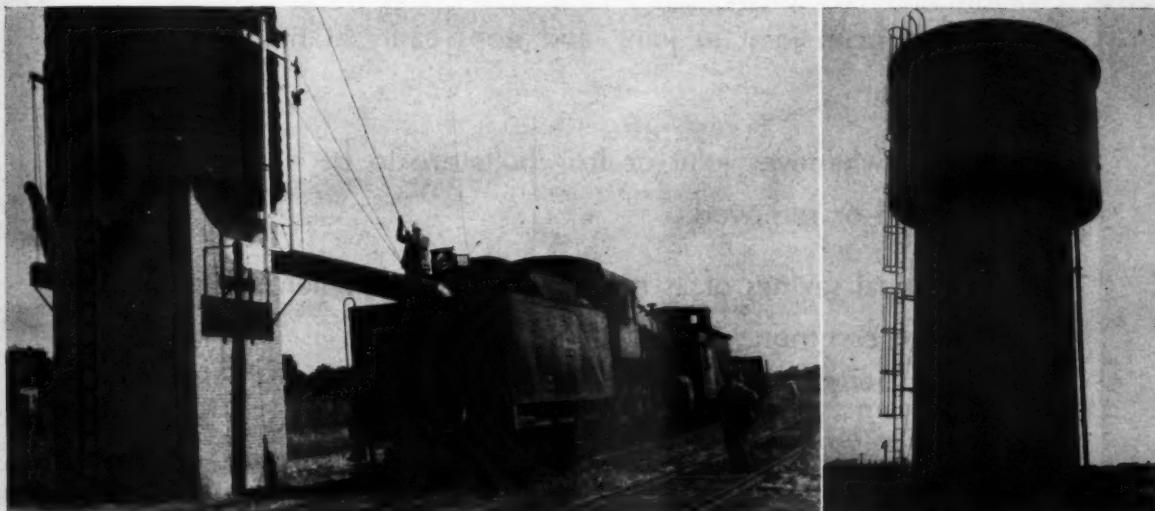
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ETH:GP



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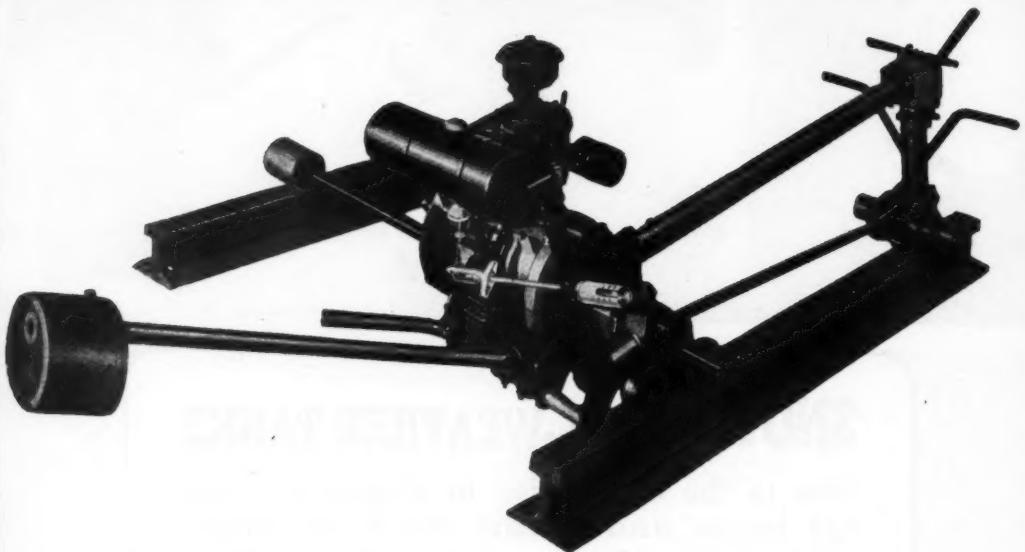
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Fast from joint to joint, and stops easily at nut, without drift.

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Extremely low cost of maintenance.

RAILROAD ACCESSORIES CORPORATION

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

MARCH, 1944

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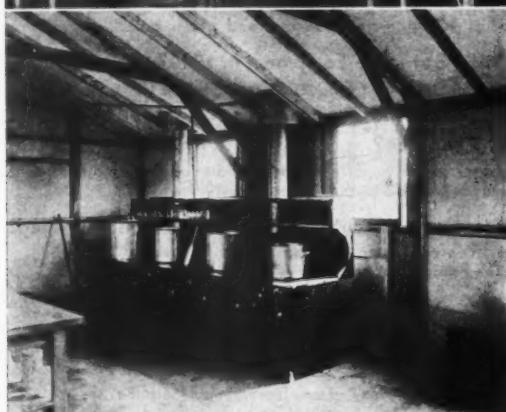
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- It takes experience—specialized experience in prefabrication—to design and panelize a building so good. Bush has this experience—ten years of producing thousands of prefabricated structures for use all over the world.
- Tell us about your requirements. Let our engineers advise you how your needs can be best adapted to this versatile building—or any other type of prefabricated structure that you might require.

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DIVISION OF CLINTON G. BUSH CO.

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Railway Engineering and Maintenance

Railway Engineering and Maintenance

The All-Out Effort

A Challenge to Maintenance Men

The year 1944 will be the crucial year of the war. This is recognized by military and civil authorities alike. The period of preparation has been completed. With the largest number of trained men ever mobilized under one flag and with these men supplied with all the many materials and supplies required in modern warfare, our forces and those of our allies have taken the initiative and are closing in on the enemy on all fronts. Everywhere he is on the defensive and is giving ground.

This encouraging turn of events by no means indicates that victory is at hand. On the contrary, the most difficult days are still ahead. The situation demands that we continue and steadily increase the pressure in order to bring complete victory, and that at the earliest possible date. And in this all-out effort, the railways and every railway employee have a part to play—a part that is as vital as that of the man at the front.

The going will be particularly difficult for maintenance of way forces. In no part of the railway plant are the ravages of traffic more pronounced. Every car and every locomotive that pass over a track or a structure take their toll in service life. And the number of cars and locomotives moving over these tracks and structures exceeds all previous records; the wear and tear is correspondingly great. This wear and tear must be made good, in one way or another, if the materials of war, the troops and the foods are to move to their destinations without interruption.

New Conditions Require New Measures

In the face of this vitally important necessity, maintenance forces face shortages of essential elements. For a year they have been denied their full needs of materials, a denial which has led to the inevitable weakening of their structures. Fortunately, however, some degree of relief is appearing, for some of the more critical materials are gradually becoming available in somewhat increasing quantities.

In labor, however, an already acute situation is becoming still more critical, until not a few roads are now unable to install even the sub-normal quantities of materials that are being made available to them. With rails failing in numbers previously unheard of, with derailments due to defects in roadway stopping the movement of traffic with increasing frequency, it is particularly serious to be unable to replace rail that is worn out with new and heavier rail that is on hand because of a lack of labor with which to make the transfer. Yet this condition exists today.

Such conditions demonstrate the extremity of the days through which we are passing—and which will continue until hostilities are brought to a successful conclusion. They call for the greatest possible versatility in meeting the changing conditions, the greatest care in the direction of work—all for the purpose of accomplishing the most in constructive output with the materials and the labor that we have, to the end that there may be no failure on the part of the railways to meet in full the transportation needs of the nation in the all-out effort to complete the job in Europe and the Pacific alike.

The weeks ahead will be difficult. They will be challenging. But men who are trained in the school of blizzards, snow blockades, washouts and wrecks, will accept the emergencies of these days and rise to the needs.



Work Equipment—

Can Larger Needs of 1944 Be Supplied?

THERE is welcome news for many maintenance men in an article beginning on page 254 of this issue, entitled *Railways Need More Work Equipment in 1944—Will They Be Able to Secure It?* The lead article in this issue, beginning on page 230, indicates unmistakably that, pressed by peak programs in the face of serious labor shortages, the railways will seek to purchase a record number of power machines and tools this year, including more than 10,000 units, from the simplest to the most complex. Having experienced difficulties in securing a somewhat smaller number of units during the last year, because of shortages in materials and the inability of manufacturers to make deliveries, the question that is uppermost in the minds of many maintenance officers today is whether they will be able to secure their increased requirements this year.

In search of the most accurate answer possible to this question, *Railway Engineering and Maintenance* questioned both the War Production Board and representative builders of maintenance of way and structures work equipment, and has summarized the answers obtained in the article first referred to. Unmistakably, the over-all picture is optimistic—more optimistic than it could have been at any time during the last twelve months. The WPB sees substantial improvement ahead in the material situation as it may affect the ability of the railways to obtain their essential requirements, and the manufacturers questioned, with few exceptions, point to an easing of military demands, increased production and other factors that affect their ability to make deliveries, and see definite prospects that in all of these respects the situation will continue to improve as the year progresses.

However, as pointed out in the article, this does not mean necessarily that any of the manufacturers questioned can fill orders today without some delay. They are still taxed to capacity in many cases, and are subject to delays in deliveries to themselves of essential materials and auxiliary equipment. They are affected also by WPB limitation and restricting orders that are still in effect, as well as by shortages of skilled labor, etc. As a result, only a few manufacturers today can make prompt deliveries of other than the simplest tools or equipment if they require critical materials. In fact, some railway supply manufacturers are still booked to capacity for many months. The outstanding fact of importance, however, is that the over-all situation is improving and promises to continue to improve.

Keenly aware that there are still many difficulties ahead, and anxious to avoid any misunderstanding in this regard, nearly all of the manufacturers questioned offered suggestions to maintenance officers to insure that their needs will receive the most favorable consideration. Summarized, these are as follows: That they follow carefully the procedure that has been set up to secure consideration of their needs; that they establish the essentiality of their needs beyond question and seek the highest priority ratings possible; that they anticipate their requirements and place their orders far in advance of actual needs; and that they accept standard models and substitute parts when, to do otherwise would complicate production and slow down deliveries.

These are all practical suggestions that should be given careful consideration by all maintenance officers. If they will heed these suggestions, and will co-operate with the manufacturers to the fullest extent, there is every reason to believe that their enlarged requirements for equipment in the remaining months of the year will be met.

Mechanization—

Has Made Great Strides in Recent Years

MECHANIZATION is the keynote of industry today. Without it, this country would be at so serious a disadvantage that it is unlikely that we could even hold our own on the world-wide battle fronts on which we are now engaged.

The railways were slow to appreciate the advantages of mechanization of their maintenance operations. This was due primarily to the fact that these operations are widely scattered and are of necessity carried out largely by relatively small mobile forces that cannot, by reason of the nature of their work, be concentrated at a few points, as the forces of industry are.

There was already a long history of mechanization in industry before mechanization in railway maintenance really got a start. Until the internal-combustion engine was developed there was little opportunity for a widespread development of power equipment for maintenance, since the machines that could be developed for steam operation were too heavy and too slow in movement to be of material assistance for most of the operations that can be performed satisfactorily only by the smaller, lighter, more responsive and quicker-acting machines that are available today.

Likewise, until a little more than a decade ago, much of the maintenance of way work equipment in service was handicapped severely by the fact that it was tied to the rails and, therefore, lacked flexibility. With the application of crawler mountings to these machines, this handicap was eliminated, they became free to work independently of the track and the range of their usefulness was greatly expanded. In fact, it may be said that these two developments—the internal-combustion engine and crawler mountings—have made the complete mechanization of maintenance of way possible. They also stimulated the expanding use of work equipment, which has been so much in evidence in recent years.

Much was learned about the value of power machines and tools in the prosecution of maintenance-of-way work during the depression years, and particularly about the ability of these machines to act as aids to depleted forces. From this point of view, the anxieties and discouragements of these years were of real benefit. They also stimulated both maintenance and executive officers to increase the number of machines in service as funds became available. It is well that they bought power machines and tools freely, of practically every type available during the last six or seven years, for, if they had not done so, they would now be handicapped much more severely than they are by the present shortage of labor.

Two items appear in bold outline in the work equipment budgets which are discussed in an article in this issue, these being the universal recognition of the inability

of the roads to maintain their tracks and structures under present conditions without the aid of power equipment, and the extreme need for more units, despite the freedom with which such equipment has been purchased during recent years. Another arresting item is the wide range of types that are considered necessary for this purpose. It is to be hoped that they will be available.

B. & B. Forces—

Should Be More Fully Mechanized on Many Roads

WHEN mention is made of the mechanization of operations carried out by the maintenance of way and structures forces of the railways, attention is first focused instinctively upon activities of track forces, rather than on those of the bridge and building forces. This was true ten or fifteen years ago, and is still true, although great strides have been taken by many roads in recent years to modernize their bridge and building operations with the newer mechanical aids now available.

There are several reasons why this situation has prevailed and continues to prevail, the first and most important of which is the larger and often more spectacular operations of the track forces. Second is the arduous character of many roadway operations, which have been mechanized primarily because of the practical impossibility of carrying them out without power machines. Third, without question, is the greater interest that has been shown by manufacturers in the broader field of track and roadway maintenance, which has led to the development and promotion of specialized machines and tools for various classes of its work. To these quite normal reasons, however, must be added at least a fourth, and that is the less receptive, less aggressive attitude of many bridge and building men toward the mechanization of all except the most difficult or arduous tasks. It cannot be denied that there has been resistance to mechanization by many of the older bridge and building employees. This attitude has not been confined to them, because there have been many track men who have likewise resisted change to modern methods just as resolutely as any bridge and building men. However, many in the bridge and building forces, and especially many old-time carpenters and painters, have considered themselves as artisans, and have shunned power tools.

Such an attitude on the part of bridge and building men could be excused on human grounds in the past, but it could hardly continue to be condoned under the pressure of the greater economy demanded during the depression period, and is entirely out of order under the still greater pressure for increased production with fewer man-hours at the present time. Fortunately, the conditions of the depression period and those that now prevail have gone a long way to break down the remaining resistance to the mechanization of most bridge and building operations.

The foregoing expression is not without knowledge of the progressive attitude that a number of the roads have shown toward the mechanization of their bridge and building forces over the years—typical of these is the New York Central, whose practices in this regard are described in this issue. It is said too, with knowledge

of the more retarded development of many of the power tools that are best adapted to a large number of the field operations of the bridge and building forces, but it must be admitted that many bridge and building gangs are still employing hand methods widely, or are equipped with outmoded, cumbersome machines, which are frequently left at headquarters because of the inconvenience, difficulty or questioned economy of setting them up in the field for any except the larger jobs.

Part of the blame for this situation must fall upon those higher maintenance officers who have not taken the lead for their men, and who have allowed the larger, more readily mechanized track operations to divert their attention from the equally important opportunities for economy and increased production in bridge and building operations. But whoever is at fault, the feeling still prevails generally that bridge and building men are trailing in the modernizing of many of their operations, particularly through their failure to make full use of the latest developments in hand-held power tools.

A.R.E.A.—

Resumes Annual Meetings

AFTER a lapse of one year, the first break in the forty-four years since its organization, the American Railway Engineering Association is resuming its annual meetings and will convene in Chicago on March 14-16. This action is well advised. The continued efficient operation of the railways is essential to the nation's war effort. The difficulties confronting the railways, and their engineering and maintenance departments, are becoming increasingly acute. United effort is required if they are to be surmounted. This meeting will promote united effort.

To justify a meeting under today's conditions requires a program that deals with these conditions. Past procedure is of secondary concern. The railway officers served by this association are pressed as never before. They need all the help possible. Examination of the program, which appears on a following page, shows appreciation of today's difficulties, and reflects a desire to contribute to their solution. Differing from past practice where the time of the meeting has been given over almost entirely to the review of the work of the committees, the meeting this year will be highlighted by sessions devoted to labor, to materials and to problems post-war, with addresses by persons specially qualified to bring up-to-the-minute information on present conditions and on what may be expected in the near future.

The A.R.E.A. has never faced a greater need and a greater opportunity. It has never presented a stronger program or one keyed more closely to the needs of the moment. Few maintenance officers can serve their roads more constructively than by attending this meeting in order to secure therefrom all the information and all the ideas that will aid them in getting the maximum returns from the all-too-inadequate labor and materials that will be available to them this year.

The action of the A.R.E.A. should provide a precedent aid also to the officers of the Roadmasters and of the Bridge and Building Associations in reaching decisions regarding their meetings this fall.



CONFRONTED with the most acute shortage of labor they have ever experienced—a shortage which is growing steadily worse month by month—and with every prospect that the present level of traffic will be maintained or, more probably, increased, throughout the year, maintenance officers are turning more and more to power machines and tools to solve a problem for which there is no other solution.

Proof of this statement is found in the purchases of work equipment in 1943, which exceeded those of all previous years in both number of units purchased and money expended for their acquisition. Added proof is also found in the fact that the current budgets for work equipment contemplate even larger purchases in 1944 than were made in 1943. Furthermore, in giving information concerning their budgets, substantially every maintenance officer participating in this study emphasized the urgency of his need for more equipment.

For two years, or since early in 1942, there has been a continuing shortage of labor that has grown steadily more severe throughout the country as a whole, and which months ago reached the critical stage in prac-

tically all areas. As if that were not enough, this difficult situation has been accentuated by unusual requirements for the maintenance of both track and structures, which have been imposed by the extraordinary traffic that is now moving and by a general increase in train speeds.

Maintenance officers learned the hard way, by experience, during the depression, that while there is no complete substitute for man-power in maintenance, power machines and tools were able to take the place of a considerable percentage of the man-power they needed but did not have available. This lesson is being driven home with greater emphasis today by the critical shortage of labor that is affecting all maintenance activities, for these officers now realize more fully than ever that unless they mechanize their forces fully, they will be unable to maintain their tracks and structures in condition for handling the enormous traffic that is moving over them.

While maintenance officers were aware generally of the value of work equipment under ordinary conditions, through intimate experience with it over a period of years, and while they had learned, during the depression,

More Than

\$13,000,000

Without Power Tie Tamper, the Tracks Could Not Be Kept to a Smooth Surface Under Today's Extraordinary Traffic

of the benefits to be derived from its use as labor becomes scarce, few of them recognized the full extent of their needs as recently as a year ago, for at that time they planned to buy fewer power machines than they had purchased in 1942. However, as their forces continued to decrease and the supply of labor from which they had drawn previously shrank almost to the vanishing point, they awoke to the extremity of their needs and, during 1943, purchased the largest amount of this equipment that they had ever purchased in a single year.

One of the primary reasons for the general belief on the part of maintenance officers that the work equipment they then possessed, with only moderate additions, would see them through, was that they did not realize the extent of the labor shortage, which was to become critical even before the opening of the 1943 working season. As a matter of fact, when these budgets were prepared late in 1942, a large number of the units that were included were intended as replacements for older machines, many of which had been carried through the depression years when only limited funds for new equipment were available, and less than the usual percentage of purchases was planned as additions.

Must Have More Machines

In contrast with this failure to foresee the severity of the labor situation a year ago, every maintenance officer is now alert to his needs and, with only a few exceptions, is planning to purchase power machines and tools on a still more liberal scale than he did eventually in 1943. Incidentally, it is of more than passing interest that, aside from motor cars, which all roads will again buy liberally, only a relatively small number of the power machines and tools included in the current budgets are for replacements, most of them being intended as additions to the number already owned. This in itself is an arresting commentary on the existing situation as maintenance officers see it individually, and represents a marked depart-

For Work Equipment in 1944

Faced with a Still More Acute Shortage of Labor, the Railways Contemplate the Purchase of More Power Machines and Tools Than They Have Ever Bought Before

ure from their thinking of only a year ago.

Present information indicates that the railways are planning to buy 7,700 units of work equipment of the larger types during 1944. In arriving at this figure, the actual number of units included in the budgets of the roads participating in this study has been extended to include all roads. The same method has been followed in estimating the number of units of individual types which are discussed on following pages. However, this figure includes relatively few of the small, portable, power-operated, hand tools, used principally in bridge and building work, of which an increasing number are purchased each year. Neither does it include many portable tools, other than tie tampers, used by the track forces, nor certain types that are seldom included in the budgets for power machines but which are invariably purchased in considerable numbers as the year advances.

On the basis of the purchases of these types that have been made in previous years, and particularly of those made in 1943, it is safe to assume that not less than 1,500 such tools will be purchased during the year. Adding these to the units concerning which the information is more definite, the total number of units which the railways plan to purchase in 1944 increases to 9,200, for which they will spend more than \$13,000,000.

In this connection, it should not be lost sight of that budget estimates invariably fall short of actual purchases of work equipment. In fact, even after consideration has been given to those items that seldom appear in the budgets, but that are invariably

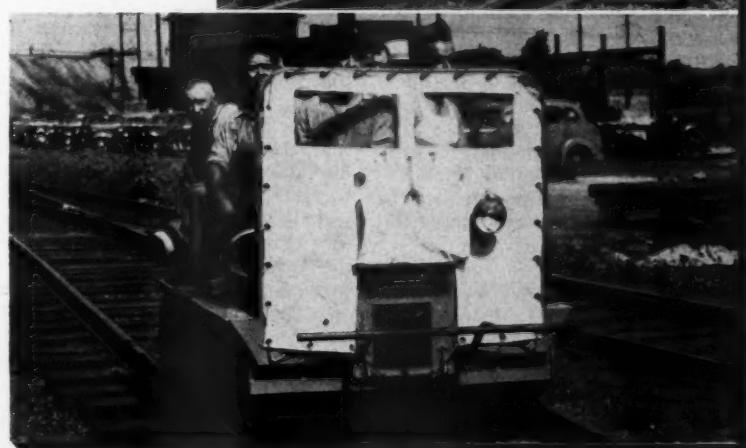
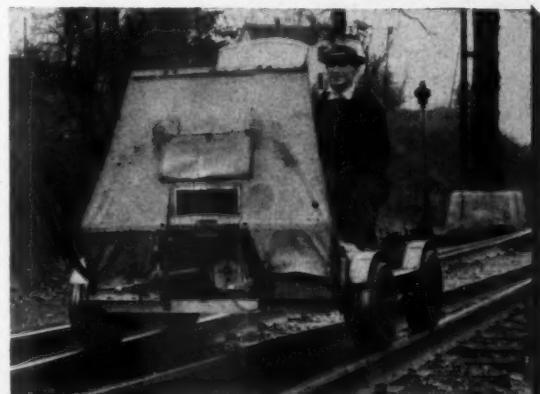
purchased during the year, the actual purchases normally exceed the budgets from 30 to 50 per cent. There is no reason to believe that purchases in 1944 will differ in this respect from those of former years, for which reason it can be assumed that the actual purchases will exceed 10,000 units.

This assumption is substantiated further by the fact that several roads that are not included in the foregoing figures, did not give detailed information as to the number of units they expected to buy, but reported the amount of money they expect to spend for power machines and tools. One of these roads, although purchasing several hundred units in 1943, expects to spend 2½ times as much in 1944 as it did in the former year.

When giving information concerning their budgets for work equipment a year ago, a number of officers whose budgets were abnormally small, gave as their explanation of this limitation in their contemplated purchases, the belief that they would be unable to obtain all of the equipment for which they foresaw a need, because of the severe restrictions that were being imposed on the use of critical materials for other than strictly military purposes. However, the War Production Board recognized the vital military need for uninterrupted transportation and the disaster that would follow a breakdown of the railways, to the degree that it released sufficient materials to bring the purchases of work equipment in 1943 to a higher level than in any previous year.

On the other hand, last year, some of the companies making equipment

Motor Cars Are Saving a Vast Number of Man-Hours and Are Thus Conserving Essential Labor



used in railway construction and maintenance had their plants so filled with vital war production that they were unable to fill railway orders, despite the release of materials to enable them to do so. At present, the pressure of war work has been relaxed somewhat through completion of contracts, and these plants are now in better position to fill railway orders. Taking all of these factors into consideration, there is no reason to believe, particularly since there has been a general easing of the critical-metals situation recently, that if the roads present their needs as convincingly this year as they did in 1943, the releases of material will not be equally liberal in every respect.

35 Roads Participate

This forecast is based on information received from 35 roads that were asked what equipment they expect to buy this year. Complete and detailed answers were given by 30 roads, representing slightly less than half of the mileage of the United States and Canada. Two of the others reported that they have not prepared budgets, preferring to make their purchases on a day to day basis, while the remaining three gave the amounts they expect to spend rather than the number of units they expect to buy. A few of the roads included in the first group, foreseeing some delay in obtaining deliveries, placed orders for much of their equipment in the latter part of 1943, and several are expecting deliveries of other units ordered in 1943.

Two of the officers participating in this study indicated that they are planning to restrict their purchases to a level below what they believe to be their actual needs, on the ground that there is little chance to obtain sufficient priorities to fill all of their requirements. Others believe, however, that the need for the power machines and power tools that they have included in their budgets is so acute, and that failure to obtain authority for their purchase will result so certainly in deterioration of vital transportation facilities, that there can be no question about the granting of this permission. Even with the increases that they have made in their budgets, several officers indicated that if allocations of materials will permit them to do so, their purchases will exceed the limits now set up.

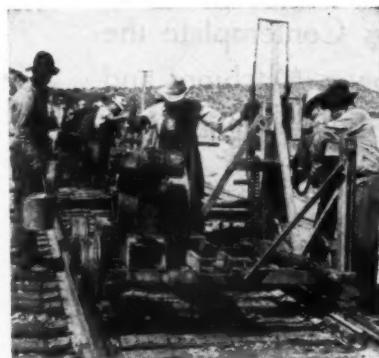
With only minor exceptions, throughout the entire development of the mechanization of maintenance, economy has been the dominant reason for the purchase of power machines and power tools. While the economy of using power equipment is realized today as fully as at any pre-

Railway Engineering and Maintenance

vious time, this basis for its use is completely overshadowed by the fact that depletion of the maintenance forces is already so severe, and is still continuing to become even more acute, that the only way that the track and structures can be maintained safely and satisfactorily is by employing work equipment to offset in part the lack of man-power.

Must Not Fail

Railway officers are aware, equally with the officers of the army and navy, that despite the distance that combat zones are removed from our



Spike Pullers and Other Machines Are Speeding Rail Renewals

shores, maintenance of the railways of this country to a high standard is as much a military necessity as the manufacture of arms, ammunition and other war equipment and supplies. In fact, military operations can be hampered seriously, and perhaps disastrously, by failure to move men and supplies expeditiously when and where the need arises. It is for these reasons that railway officers feel such deep concern over the present and prospective deficiency in labor, and are so desirous of obtaining the power machines that will in large measure offset this deficiency in labor.

Not a few officers still in active service recall the conditions during World War I when there was a similar but less acute labor shortage. At that time, however, only a few types of work equipment were available and the supply of these was so limited that there was almost a negligible mechanization of the maintenance forces. These officers also recall the serious deterioration of railway facilities that then occurred by reason of the lack of man-power when there was no mechanical aids to fall back on. They can better visualize the extent to which track and structures can now be expected to deteriorate and the degree to which the carrying capacity of the railways can be reduced if similar deterioration is allowed to

take place through lack of the needed power machines.

Obviously, the total purchases of work equipment year by year are of both interest and value because they become a measure of the expanding use of this equipment and of the extent to which it is being employed in railway maintenance. The value of this information is greatly enhanced, however, if the latest trends in the use of power machines and power tools can be traced by means of these purchases. To permit an analysis of these trends to be made, the chief engineers and engineers maintenance of way who were solicited for information concerning their plans, were also requested to give detailed information with respect to the number of units of each type of equipment that they have included in their budgets.

Include Many Types

In the replies that were received, 89 types were mentioned specifically, the largest number of types heretofore budgeted. This list did not include many of the small tools used in bridge and building work, many of the reports merely specifying so many "sets of small portable power-operated hand tools for bridge and building work." It is not surprising, however, that the lists, as they were given by individual roads, cover a wide range with respect to both sizes and types, for an equally wide range of maintenance purposes—heavy grading equipment, power shovels, carryalls, draglines, ditchers, tractors and auxiliary attachments, locomotive cranes, excavating buckets, spreader-ditchers, machines incidental to laying rail, ballasting and renewing ties, pile drivers and other bridge equipment, jackhammers, paving breakers, impact and other power wrenches, rail saws, grinders and portable wood-working tools.

However, the 89 individual types also include machines for mixing and placing concrete, for maintaining rail, for cleaning ballast, for providing drainage, for controlling weeds, for maintaining bridges and buildings, for cleaning and painting structures, and for practically all other maintenance operations for which power machines and tools are available. Previous experience makes it certain that more than these 89 types will be purchased, for even when buying is restricted, the number of types actually purchased invariably exceeds the number included in the budgets. When buying is largely unrestricted, as it is likely to be this year, the number of types purchased may range from 60 to 100 per cent more than were contemplated at the beginning of the year.

While all plans for the use of ma-

terials are dependent upon military necessity, the War Production Board has allocated 1,800,000 tons of steel for new rails during 1944, an increase of approximately 40 per cent, compared with the amount actually laid last year, and there are no present indications of the severe cuts that have characterized previous allocations. This will in itself greatly increase maintenance activities, not only so far as the laying of the rail is concerned, but also in many related items. For this reason, despite the large number of such machines purchased during the last three years, the budgets contain provision for 846 units to be employed for laying rail, although some of them will also be employed later in connection with rail maintenance. These machines include adzing machines, bolt tighteners, spike pullers, spike drivers, rail cranes, rail layers, rail and bonding drills, and surface and cross grinders. This is the largest number of units of these types ever to be included in the budgets, and is more than 2½ times as many as were in the budgets for 1943.

In general, rail programs are accompanied by ballasting programs of corresponding magnitude, and this calls for reshaping and strengthening the roadbed to insure the largest return on the expenditure for rail and ballast. This also calls for a stable roadbed which, obviously, cannot be maintained without adequate drainage. With the advent of higher train speeds, the need for more and better surface and subsurface drainage has been recognized more fully than ever before. This need has been emphasized still further by the increasing volume of traffic that the railways are now being called on to handle, and by the absolute necessity that nothing shall be left undone to insure dependable and uninterrupted service for military requirements.

Will Surface More Track

Information which these officers have given us indicates not only that they are planning a marked increase in the volume of ballast to be applied in connection with the new rail, but also in the mileage of other tracks to be ballasted. They also expect to surface more track out of face without the application of ballast than they did last year.

There are many reasons, all of them valid, why vegetation should be kept out of the track and from the shoulders of roadbed, and under control on the remainder of the right of way. Neglect to keep the roadbed and ballast clear of weeds results in defective drainage and an increased expenditure of labor to maintain line and surface, while it necessitates more

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frequent applications of ballast to overcome clogged drainage. Uncontrolled growth on the right of way not only presents an undesirable appearance, but creates a hazard of fires that may destroy structures and thereby delay or endanger traffic. Such fires are prone to extend to adjacent property and destroy crops and farm buildings. To avoid these risks, the budgets for 1944 contain provisions for 231 weed-destroying units, including weed burners, fire extinguisher cars, discers and mowing machines of various types. In addition, if weed-destroying chemicals become available in sufficient quantities, a number of roads are planning to utilize chemical weed killers.

Need Highway Vehicles

Although the purchase of highway vehicles has been greatly restricted during the last two years, for reasons that are well known, the need for them by the railways has been increasing because of the difficulties encountered in moving men and materials by rail, particularly in emergencies, owing to the curtailment of local freight and passenger service. More than one officer indicated that the needs for highway vehicles are becoming more and more acute, since, at present, train schedules are arranged primarily for moving a vast volume of traffic expeditiously, rather than for the convenience of repair gangs, which are

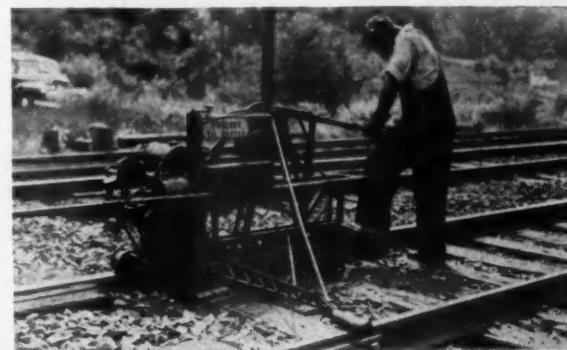
power shovels, draglines, cranes, tractors and tractor attachments, road rollers, scrapers of various types and other units, not a single one is rail-mounted, but all are designed for off-track operation. Incidentally, this is the largest number of earth-moving units ever to be included in the annual budgets of the railways.

Tamping Outfits Smaller

Another trend that is being emphasized more this year than in previous years is seen in the purchases of tie-tamping equipment of the lighter types. The original conception of the tie tamper envisioned its use only with large ballasting gangs. As a consequence, until recently, tie-tamping outfits were too cumbersome and costly to permit them to be assigned to small gangs engaged in routine surfacing. However, the unit tamper has met with such a ready response that the conventional outfits have been redesigned to make them suitable for section-gang use, and the purchases of these smaller outfits have increased very rapidly in the last two or three years.

Indicating the wide range and the large amount of surfacing that is planned for this year, it is estimated that the railways have budgeted 690 complete tie-tamping outfits, both electric and pneumatic, and 340 unit tampers. This equipment ranges from the unit type to outfits of 4 to 16

Tie Cutters Facilitate the Removal of Ties and Save Many Man-Hours



thus forced to adopt other means than trains for their transportation. As a consequence, the budgets for 1944 contain provision for 239 automobiles and motor trucks, the largest aggregate number included in the budgets for any previous year.

This high density of traffic, and the speeds at which trains are being operated, is also emphasizing a trend that has been evident for a number of years. This is the use of off-track equipment, which will be continued on a larger scale this year. Of 371 earth-moving units that are included in the budgets for the year, including

tools, although the 4-tool outfits greatly outnumber the larger units, while there are a considerable number of the 8-tool size. In addition, the railways are planning to purchase an estimated 315 individual tamping tools.

As has been explained, anything approaching a close estimate of the number of small, easily-portable, power-operated hand tools to be purchased is not possible, for only a few of the budgets include such tools, although a large number of them are purchased every year. On the other hand, specific mention was made of

(Continued on page 261)



The Southern Pacific Is Well Equipped with Earth-Moving Machines of Many Kinds

How the Southern Pacific Maintains Its Work Equipment

FOR many years the use of power machines and tools in maintenance has been an established practice on the Southern Pacific, and in recent years the amount of this equipment in service has increased steadily. It is well that this is so, for, in view of the present stringency in labor, it is doubtful whether the track and structures could now be kept in condition for the passage of the enormous volume of traffic that is moving, without the assistance of this equipment.

A Recent Development

With a few notable exceptions, such as motor cars, pile drivers and locomotive cranes, practically all of the power machines and power tools now used in maintenance of way work are a development of the last quarter-century, or within the knowledge of many men still in active service. While the early machines were crude and heavy, compared with those of today, and many of them were unsatisfactory with respect to performance, those of today are easy to operate, have marked flexibility and are generally efficient mechanically.

Adapted from papers presented at a recent meeting of the Pacific Railway Club, by F. L. Guy, engineer maintenance of way and structures, and R. B. Chapman, supervisor of work equipment and welding, of the Pacific Lines of this road. In this article, the various types of power machines and tools in service are reviewed and the uses that are made of them are explained. The manner in which they are assigned and maintained and the facilities for their maintenance are described, together with the methods of recording their performance and condition

Recently, the applications of work equipment have been expanded greatly and a surprising variety of uses have already been found, while the field of usefulness is still widening. Obviously, not all of the machines available or all of the uses to which they are being put can be mentioned here, but some of the more important of the types and their applications will be discussed.

The track forces use steam shovels, ditchers, spreader-ditchers, power shovels, draglines, pull shovels, skimmers and motor trucks for drainage and other roadbed maintenance. They use locomotive and other cranes for handling heavy loads. The motor car is the transportation unit for track forces. For laying rail they employ the spike puller and spike driver, the bolting machine, the tie adzzer and the rail crane. For routine maintenance

and large surfacing projects they employ track shifters, power jacks, air compressors, generating units and tie-tamping tools. In maintaining the rail after it has been laid, they also employ gas and electric-welding equipment, surface grinders, rail-end slotters, stock-rail grinders

and rail and flange lubricators. For emergency work at night they have portable electric-light plants. For the purpose of controlling vegetation on the roadbed and right of way, they employ weed burners and mowing machines of several types.

Maintenance Work Varied

Of all the departments that make up the railway organization, the mechanization of the maintenance-of-way forces is the most notable because these forces are the most numerous, their work is more varied and they are widely scattered and made up of many small or relatively small units. In addition to ordinary maintenance, they are often called on to do extensive grading for additional tracks or to provide new roadbeds for the construction of spur tracks. In this

service, in addition to the earth-moving equipment already mentioned, they employ such machines as carryalls, tractors, bulldozers, sheeps-foot rollers, rooters, front-end loaders and dump trucks, as well as other types.

So greatly have these modern excavating and haulage machines reduced the cost of grading that the Southern Pacific has found it feasible to substitute open cuts for some of its tunnels, although at the time the line was built the time and cost involved for making the cut with the somewhat primitive earth-moving equipment then available, was considered prohibitive. Some of us are able to breathe a little easier every time a narrow, timber-lined tunnel is eliminated, and we are doing this at the rate of about one a year.

It would be an impossible task to handle and lay the present heavy rail by hand, as was done with the lighter sections of only a few years ago, and mention has been made of the many power machines and tools that are now employed in this operation. After the rail has been laid a surfacing gang follows closely behind. It uses a power jack to raise the track enough so that the worn and failed ties can be replaced and all ties spaced correctly. In the meantime the embankments have been widened and the cuts cleaned out with some of the earth-moving equipment that has been mentioned, and the shoulder of the roadbed has been leveled with a spreader-ditcher.

Ballast is then unloaded from modern ballast cars that are so designed that the flow of the ballast can be controlled closely. A surfacing gang follows, which is also equipped with a power jack. The track is then raised to the elevation indicated by the grade stakes and is tamped lightly by hand with shovels or ballast forks. After the ballast has been compacted by traffic, it is gone over again, this time with mechanical tie tampers, to give

the ties a uniform and solid bearing. Much of the drudgery of track work has been eliminated through the use of these machines, while track worked over with power tamping tools will hold up much longer than when tamped by hand.

Section Gangs Get Tools

Great strides have also been made in equipping small section gangs with power tools, the most important of which are the track motor car and the unit tie tamper. These gangs are transported on motor cars having wind shields, electric headlights and free-running engines. Many of these gangs now have two or more tie tampers which eliminate the arduous hand tamping so common until recently, and still a practice on some roads.

One of the most recent and useful aids to maintenance is the welding outfit. With the heavy traffic now moving, rail, switches, frogs and crossings are wearing out faster than has ever been known, and if it were not for welding to recondition rail ends and repair switches, frogs and crossings, the railways would be in a much less favorable position in handling this enormous traffic than they now are.

Rail inspection is another feature of maintenance which has always been important, but which is now receiving more attention than formerly, partly because of the marked increase in train speeds and partly because of the present high traffic density. Among the devices used for this purpose is the detector car which is employed to discover internal defects in the rail. While the results obtained from these cars are not perfect, they are showing improvement as new developments in the detection devices are made. Another device is the magnifying mirror which is used to observe the under-

side of the railhead and thus detect the presence of fillet cracks, split heads and cracked webs.

Bridge and Building Tools

While the bridge and building forces are small, compared with those engaged in track maintenance, their work is highly specialized and they require specialized tools, although some of the machines they employ are common to both forces. Air compressors are used to advantage in the operation of drills, concrete breakers, spades, back-fill tampers, wrenches, impact wrenches and chain saws. Most of the bridge gangs find the small push-car cranes indispensable. These cranes can handle as many as four bridge stringers at one time. For the heavier jobs, a few of the gangs, particularly those engaged in structural-steel repairs and replacements, require cranes of larger capacity; ranging up to the larger locomotive cranes.

Many roads have specialized concrete gangs that are equipped with concrete mixers having power loading skips and water-control regulators. Where concrete jobs are near central mixing plants, the concrete is mixed in such plants and hauled to the job in open trucks or transit mixers. In tunnels, the concrete is deposited, particularly in the overhead portion of the lining, by means of pneumatic placers.

In recent years many of our bridge and building gangs have been given motor trucks to transport men, tools and materials by highway, over distances up to 70 miles from their headquarters to enable them to perform essential maintenance work. We are also assigning crawler-mounted shovels, cranes with clamshell buckets and even bulldozers, to bridge, building and concrete gangs for excavating bridge, building and retaining-wall foundations, and similar work. We

Rail-Laying Machines Are System Equipment and Are Moved from Division to Division as Needed



are also equipping these gangs with portable power-driven pumps, portable electric-lighting plants and a wide variety of portable power-driven hand tools, both pneumatic and electric. Headquarters gangs also are given electrically-operated table saws for prefabricating much of the material used in various types of bridge and building work.

The hydrauger is used for boring holes for drainage installations and for placing culvert pipes through embankments. Paint gangs are equipped with paint-spraying outfits, and other gangs have welding equipment and cutting torches. One of our specialized gangs has a portable precision torch.



Large Grading Units Engaged in Eliminating a Tunnel by Means of an Open Cut

powered with a small electric motor, which is rail mounted so that it can be operated on the track.

In the water-service department the art of welding has altered some long-established practices. Tanks are now welded instead of riveted; pipe is welded, doing away in large part with coupling devices. This department also makes excellent use of crawler equipment to dig trenches, to distribute and place pipe and to backfill trenches. The power plants on these machines are sometimes used in emergencies to operate pumps for water supply.

Signal gangs use air compressors and a variety of pneumatic tools for digging and backfilling trenches for cables and for drilling rock where necessary in the construction of foundations for poles and other equipment. They also use grinding, drilling and other tools in fitting power machines. They employ motor trucks extensively for transporting men, materials and tools. When installing signals or centralized traffic control, all material is shipped to a central point from which it is distributed by motor truck as needed.

Requires Organization

Obviously, a road that owns a considerable amount of work equipment must have an organization to look

after it and adequate facilities for its maintenance and repair; otherwise only a minor part of its potential benefits can be realized. On the Southern Pacific, work equipment is divided into two classes, system and division machines and tools, the latter being assigned permanently to the divisions upon which they are to be used. On the other hand, system units are moved from division to division in accordance with assignments made by the engineer maintenance of way and structures.

System equipment consists generally of earth-moving units and the larger machines of other types. It includes 12 ditchers, 10 steam shovels,

sions, although after this assignment they are the sole responsibility of the divisions, which must maintain them.

Ten Operating Divisions

There are ten operating divisions on the Pacific Lines of this road, each of which is an independent unit with respect to the maintenance and operation of the work equipment assigned to it permanently. When system equipment is assigned to a division, that division is expected to provide the operators, except on shovels, ditchers and welding equipment, the operators of which are assigned permanently to the units and stay with them as they are moved.

Each division has a shop for repairing the power machines and tools that are assigned to it permanently. These shops were originally signal-department repair shops, but as motor cars came into use, the divisions had no shop facilities for making repairs or mechanics capable of making them, except in the signal shops. These shops were expanded, therefore, to include motor cars and, later, as other types of machines were acquired, they were also cared for. These division shops are still operated by the division signal supervisors under the direction of the signal engineer.

As the work expanded with the further acquisition of power machines and tools, these shops have been separated into two sections, one devoted to signal repairs and the other to work equipment, until the shop at Portland, Ore., the largest division shop on the system, employs 6 men on signal repairs and 14 men on maintenance of way work equipment, including two field repairmen.

Each division has at least one traveling field repairman, all repairmen being under exclusive division direction. The system organization includes no field maintainers, but is confined to the supervisor of work equipment and welding and his assistant, since the maintenance of the machines in the field, including both system and division machines, is the responsibility of the divisions upon which they are employed. Where a large concentration of equipment occurs, repairmen are stationed with the gang that is using it and are supplied with the tools necessary for its maintenance.

The System Shop

There is, however, a system shop at West Oakland, Cal., devoted exclusively to the repair of maintenance-of-way work equipment, which handles all repairs to system equipment, other than those made in the field, ex-

20 gas and Diesel-powered shovels, 33 tractor bulldozers, 16 carryalls, 32 dump trucks and 30 electric-welding outfits. It also includes such equipment as rooters and sheep's foot rollers, and 19 locomotive cranes employed solely in maintenance of way work, which are in addition to a number that are assigned full time to motive power and storehouse use. There are also 19 pile drivers in the system equipment, including three scow drivers and one skid driver. Moreover, many of the gas and Diesel shovels are equipped with long booms for driving piles, dragline operation and other purposes. Similar equipment is also assigned to the individual divisions, which operate and maintain them independently of the central system organization.

All tie tampers, including spot tampers, are considered system equipment and are moved from division to division as needed. This equipment includes 10 two-tool spot tampers; 107 four-tool outfits; and 17 larger outfits, ranging from 8 to 16 tools each. All told, the system equipment represents an investment of more than \$2,000,000, all under the direction of the system supervisor of work equipment and welding. This is exclusive of motor cars and other units of division equipment. However, the system central organization purchases and assigns motor cars to the divi-

cept to steam-operated machines which are sent to the locomotive shop at Sacramento. The West Oakland shop also repairs all pneumatic hand tools, and supplies all repair parts used for all classes of equipment repaired in the division shops.

Worn parts of the heavier units, such as dipper teeth, cutting edges for bulldozers and carryalls, ditchers, tractors, sprockets, travel pads, rollers and others, are reconditioned by welding. Tie-tamping bars are also reconditioned by adding metal, giving them a further life two to three times that of the original metal. Metallizing equipment has been added recently to reclaim worn shafts and other bearing parts.

This shop is also equipped with the tools necessary to recondition both gasoline and Diesel engines. Motor blocks are rebored or refined, pistons are ground finished to correct tolerances, valves and valve seats are ground or valve-seat inserts are installed, and crankshaft bearings are line-reamed and refitted. The shop also has a piston grinder with which oversize pistons are reground for use in cylinders of smaller bore. Formerly, most of this work was sent out to commercial shops, but at present they are engaged so largely in heavy repair work for the army and navy that the installation of these tools is saving the railway a great deal of time. No attempt is made, however, to repair fuel pumps or injection nozzles on Diesel engines, since special testing equipment is necessary, and this work is sent to commercial shops.

Included in the 42 shovels and ditchers in regular service are eight shovels of one size and make. For this group an extra set of engine cylinder blocks, fitted with valves, piston rings and pins is kept on hand, which can be exchanged in the field with little delay to the machine. There is also an exchange service for dippers, dipper sticks and tread rollers for most of the shovels and ditchers. When the operator of one of the machines receives an exchange part from the shop, he makes the exchange at a time when there will be the least interference with the work. There is also a similar arrangement for a large group of portable air compressors and for another group of gasoline-engine-driven tractors.

Selecting Operators

Operators for the larger units are selected from among those who have been under training on other machines for some time and who are, in large part, capable of making their own repairs. Those on the smaller machines are usually chosen from the

Railway Engineering and Maintenance

division gangs that are using the machines, and they usually require a great deal of instruction and supervision in the operation and care of the equipment. In this connection, many experienced operators are now in the armed services, and this has necessitated the promotion of men who are not trained adequately.

Maintenance of way officers in the field realize, now as never before, the advantages of machine operation, and they demand quick service with respect to repairs to the equipment they are working. Requests for repair parts are made on the engineer maintenance of way and structures, where references are checked with the machine record before the requisitions are passed for the purchase. To facilitate this check, a careful record is kept of each machine and its accessories, including all name-plate data and the extent and character of any alterations made.

Reports

To insure that up-to-date information will be available regarding the condition of the various units, the operator of each machine is required to make a report every 10 days, giving the class of work being performed, the condition of the machine

The supervisor of work equipment also receives a monthly report from each division, showing the work done during the period by each unit of the system equipment assigned to it. This report is intended to be a record of the use and output of these machines, while the operators' reports are primarily for the purpose of showing the current condition of the machines.

Safety Measures Taken

Safety has a very large place in the operation of roadway machines on the Southern Pacific. Every effort is made to reduce the hazard of personal injury to the minimum. To this end operators are instructed how to handle their machines safely, and foremen are educated how to direct their men when they are working around a machine. With this thought also in mind, alterations or additions have been made to many of the machines for the purpose of preventing accidents. Two examples of alterations that have been made will illustrate the effort that is being made along this line.

When adzing ties, the cutter head of the adzing machine runs at high speed in a horizontal plane. These machines are continually picking up spikes, bond wires and other objects,

Spreader Play an Important Part in Construction and Maintenance on the Southern Pacific



and any further comment that he may desire to make. The report also includes requests for such parts as he foresees he will need in the near future and the approximate date when he expects that they will be required. These reports are sent to the supervisor of work equipment and welding, and are filed with the record of the particular machines to which they refer. They often show that an inexperienced operator has been assigned to a machine, or that it is not being cared for as it should be. In either event the supervisor or his assistant calls on the operator and gives him the necessary instruction.

which are hurled with terrific force, causing severe injuries if they hit a person. To avoid this hazard, a guard was installed, resembling a sled runner 30 in. long and 8 in. high, that slides along the top of the tie between the cutter head and the feet and lower part of the legs of the operator. Since these guards were installed there has not been a personal injury from this cause. We also found that men were using rail cranes as a means of transportation within job limits, and that they were continually getting hurt. Footboards, hand rails and guards over working parts have practically eliminated these accidents.

Southern Looks to Off-Track

to Solve Its

Grading operations on the Southern are now being performed more economically and effectively than ever before with modern types of off-track grading equipment. The work for which such equipment is being employed most widely includes side-ditching and grading in connection with curve-realinement projects, although it is also being used for a wide variety of other tasks. This article traces the introduction of such equipment on this road, discusses the number and types of machines used, how they are used and the results obtained

A RAPID trend toward the use of modern types of off-track grading equipment is now in progress on the Southern, as a result of which this road is realizing substantial economies and other benefits in carrying out various types of grading work. Primarily, the types of work for which such equipment is being used fall into two categories, namely (1) side-ditching and related operations, and (2) grading in connection with curve-realinement projects. For grading operations of these types, the road has found that crawler tractors fitted with dozer attachments and used in combination with scrape-wagons are highly adaptable, and it has, accordingly, acquired a considerable amount of equipment of this type, including 26 crawler tractors and 18 scrape-wagons.

While the two categories of work mentioned above comprise by far the greatest part of the grading work that is being performed by off-track equipment of the types mentioned, a wide variety of other grading operations are also being carried out on an increasing scale with this equipment. Likewise, in addition to the tractors and scrape-wagons, this road is using a considerable amount of other types of off-track grading equipment, such as crawler shovels and draglines, and it is likely that the types of machines, as well as the number in operation, will show substantial increases over the long term as experience is gained with the present equipment and as other types are tested and found applicable to the needs of the road. In fact, notwithstanding the progress made to date, it is considered by this company that the application of modern off-track equipment to its grading problems is still more or less in the

development stage and that much is yet to be learned and many machines of new and different types are still to be acquired before there can be any thought that the most effective and economical grading methods have been brought into use.

Reasons for Trend

The decision to acquire a substantial quantity of modern off-track grading equipment on the Southern has come about as the result of a combination of factors. Prominent among these has been the necessity of inaugurating a program of curve realinement on several of the company's main lines preliminary to shortening schedules incident to the introduction of high-speed, streamlined passenger equipment. Specifically, there was a need for an extensive amount of such work on the company's lines between Washington, D. C., and Atlanta, Ga.; between Atlanta and Birmingham, Ala., and between Atlanta and Macon, Ga.

In practically all undertakings looking to the reduction of curvature, some grading is required, and in the large majority of projects the amount of material to be moved is not only substantial but is likely to be the largest single item of work involved. On the Southern, when several curve-realinement jobs were undertaken in 1940, the prospects were that this type of work would continue over a considerable period into the future. Previously, when undertaking any improvement project involving a considerable amount of grading, it had normally been the practice of this road to award a contract for the work to a private concern. However, in view of the prospect that curve-re-

alinement projects involving substantial amounts of grading will constitute a regular item of work for some time to come, the question was raised whether it would be more economical for the company to develop its own grading organization, suitably equipped with the most modern machines, for it was apparent that the amount of grading to be done was sufficient to provide work for a considerable amount of such equipment for an indefinite period.

Needed for Side-Ditching

A second important factor behind this company's decision to purchase modern grading equipment on a large scale was the need for placing its side-ditching operations on a more efficient, economical and effective basis. Side-ditching is an important and continuing function on every road; on the Southern it is especially so because of a combination of conditions that contribute to a high rate of soil erosion in much of the territory traversed. Among these is the fact that the soil consists largely of a red clay that breaks down readily in the presence of water, and this, added to the further fact that rainfall is relatively heavy in the territory served by this road, has the effect of setting the stage for a situation in which the washing of material from cut slopes into the side ditches occurs at a relatively rapid rate. In some districts a further factor contributing to this condition is the alternate freezing (at night) and thawing (during the day) of the top layer of soil in the winter months, thereby helping further to break down the surface material on cut slopes. As a result of these factors, the side ditches in many cuts on this road fill up every year and must be cleaned annually to secure adequate drainage.

For many years, side-ditching work on the Southern was done almost solely by steam ditchers operated in work trains in connection with dump cars for hauling the material and dumping it to widen embankments. It was largely for this purpose that the company maintained about 25 steam ditchers and 150 dump cars. In re-

Equipment

Grading Problems

cent years, the desirability of reducing the use of on-track equipment to a minimum because of the resulting traffic delays has prompted the railroad to search for more suitable and economical methods of performing this class of work, and in this search it was apparent that the answer to the problem was to be found in adapting to the work the most effective combination of off-track equipment of the types that had come into such wide use by grading contractors. Still another consideration that tended to detract from the suitability of the steam ditchers was the fact that, in the interests of adequate roadbed drainage, experience had demonstrated the need for side ditches of greater depths at many locations than could be provided by a steam dumper operating from a flat car.

Other Applications

Aside from the foregoing considerations, it was recognized that off-track grading equipment could be applied advantageously to a wide variety of other types of grading work, such as the construction of drainage and berm ditches, the shaping of the roadbed for the construction of new trackage of various types, and other routine operations. In addition, this company has had under way for a number of years a comprehensive trestle-filling program, and this type of work appeared to offer opportunities for the use of off-track equipment, especially crawler bulldozers for spreading and compacting material from dump cars.

As early as 1927, the Southern began the purchase of off-track grading equipment in the form of crawler shovels and cranes, and at the present time it has a total of 19 machines of these types. These include six 10-ton cranes with 40-ft. booms, two of which have $\frac{3}{4}$ -yd. shovel attachments. Also included are 13 crawler shovels, ranging in capacity from $\frac{3}{4}$ yd. to $1\frac{1}{2}$ yd., of which six are convertible to use as cranes. All these machines are driven with either gasoline or Diesel engines.

But it was not until late in the 'thirties that the company began to

Right—The Scrape-Wagon Outfits Are Suitable for a Wide Variety of Earth-Moving Operations. Below—Showing a Scrape Wagon Being Loaded With the Aid of a Pusher Tractor



give serious consideration to other types of off-track equipment, this consideration being largely motivated, as noted above, by the increasing necessity of reducing delays incident to the use of on-track equipment in connection with side-ditching work, and in view of the large amount of grading that was in prospect in carrying out the impending curve-realinement program. As the result of a careful study of the subject, the railroad decided that under most conditions both of these types of work could be performed most effectively and economically with outfits consisting of scrape-wagons (Carryalls) drawn by crawler tractors, the idea being that scrape-wagons of the smaller sizes would be most suitable for the ditching work, and larger units for the heavier grad-

ing jobs that would be involved in the curve-realinement work. There was no thought that equipment of this type would be applicable on all jobs in the two categories; rather it was contemplated that, as experience was acquired in the operation of such machines, it might be found desirable to acquire machines of still other types for use under certain conditions.

Record of Purchases

The first purchases of scrape-wagons and crawler tractors were made in 1939, and were of an experimental nature. In that year the company acquired four tractors with dozer attachments, including three Model K (44 hp.) Allis-Chalmers machines and one Model CG (48 hp.) Cletrac

tractor. Two of these were purchased especially for use in connection with trestle-filling jobs. To try out its ideas regarding the use of scrape-wagons for ditching and other grading operations, the company acquired a 3½-cu. yd. LeTourneau Carryall in 1939. In the following year, four additional Allis-Chalmers Model K tractors were acquired. In 1940, the road also obtained a scrape-wagon outfit consisting of an 8-yd. LeTourneau Carryall, drawn by an 80-hp. Caterpillar Diesel tractor.

On the basis of experience with the equipment acquired in 1939 and 1940, the road stepped up its purchases of such equipment in 1941, acquiring eight more Diesel-powered tractors with dozer attachments, and seven scrape-wagons. Of these eight tractors, five were Caterpillar Model D7 (80-hp.) units, two were Allis-Chalmers Model HD7 (55-hp.) machines, and one was a Caterpillar Model D4 (35-hp.) tractor. Of the scrape-wagons, which were all LeTourneau Carryalls, four were 8-yd. machines for use primarily on curve-realignment and other heavy grading jobs, and three were 3½-yd. units for use in ditching work.

Following these purchases in 1941, the company made plans to acquire a still larger amount of such equipment in 1942, including seven 8-yd. and seven 3½-yd. wagon scrapers, and seven 80-hp. and nine 55-hp. tractors, all with dozer attachments, or a total of 14 wagon scrapers and 16 tractors. Unfortunately, these plans could not be placed in effect because on February 19, 1942, the War Production Board issued an order "freezing" all crawler equipment, and for some time thereafter the entire output of such equipment was absorbed by the armed forces. However, later in that year the road was able to obtain a small amount of rebuilt equipment from a dealer. This included two tractor-drawn wagon-scraper outfits, one consisting of a Caterpillar D50 (58-hp.) tractor with dozer attachment and a 6-yd. LeTourneau Carryall, and the other comprising an RD7 (61hp.) Caterpillar tractor with a dozer blade and 61-yd. Carryall.

Meanwhile, wartime and other influences were operating to bring about a deterioration of the side ditches on many miles of line. With the soil condition such as to necessitate that such ditches be given frequent attention, a number of factors had been introduced into the situation that were reducing the effectiveness of the steam ditchers, which still constituted the chief means for ditching work. One of these was the fact that, for various reasons, a number of the steam ditchers had been retired; in fact, by 1943

the number of such units available for service had been reduced to 19, as compared with 25 a few years previously. Also, owing to a considerable increase in the density of traffic the work trains carrying steam ditchers were subject to more frequent interruptions than formerly, with the result that the actual working time was often reduced to but a few hours daily. Moreover, the number of scrape-wagon outfits available of the proper size for ditching work was entirely inadequate to compensate for the reduced effectiveness of the steam ditchers.

Confronted with this situation, the railroad decided to place its case before the War Production Board in an effort to obtain additional scrape-wagon outfits of the size suitable for ditching work. In its application, the road pointed to the deterioration that was taking place in the condition of its side ditches because of the reasons cited above. It also argued that the acquisition of sufficient scrape-wagon outfits would make it possible to bring about a reduction in the number of work trains used in ditching service, thereby releasing motive power that was urgently needed for handling war traffic. Still another consideration cited was the fact that the wider use of off-track ditching equipment would have the further beneficial effect of reducing train delays caused by the presence of work trains on main tracks.

That the foregoing arguments carried weight with the WPB is indicated by the fact that the road was given authority to purchase seven additional scrape-wagon outfits, consisting of seven 4.7-yd. Heil scrape-wagons, five Allis-Chalmers Model K tractors and two Allis-Chalmers Model HD7 tractors, all of the tractors being fitted with dozer blades. In spite of its heavy purchases of off-track grading outfits in recent years, this company has not by any means been able to satisfy its needs for such equipment, and it is expected that further substantial purchases will be made as conditions permit.

Equipment Now Owed

To recapitulate, the road now has available a total of 26 crawler tractors and 18 scrape-wagons. Of the latter, 11 are of the sizes (3½-yd. and 4.7-yd.) that are considered most suitable for ditching work, while 7 are 6-yd. and 8-yd. machines that were obtained primarily for use on curve-realignment projects, although these also are used to a limited extent for cleaning side ditches as well as other classes of grading work. The tractors in the 44-hp. class, and those slightly larger,

are used for hauling the smaller scrape-wagons, while the 80-hp. machines are employed with the larger Carryalls. The surplus of tractors over scrape-wagons is explained by the fact that the tractors, fitted with dozer attachments of various types, are frequently employed on spreading and compacting jobs, such as trestle-filling projects, where the use of scrape-wagons is not indicated. Also, on the larger grading jobs involving the use of several scrape-wagons, it is necessary to have an extra tractor for use as a pusher when loading the wagons and for spreading and dressing the embankment.

The Southern is also using several types of auxiliary equipment in connection with its off-track grading machines. One of these is a rooter for use on jobs where the character of the material being excavated is such that it must be loosened to facilitate the loading of the scrape-wagons. Drawn by a tractor, the rooter is provided with heavy teeth and is capable of gouging or plowing hard-packed or shaly material of considerable hardness. Four rooters are now in use. Another auxiliary device that is proving highly useful is a small (2.7-cu. ft. capacity) portable gasoline-engine-driven air-compressor for inflating the pneumatic tires of the scrape-wagons. Eight of these units have been acquired.

Ditching Methods

When used in side-ditching service, the scrape-wagon outfits are simply operated back and forth through the cut, taking a load in each direction and dumping it at a convenient place at each end, until the ditch has been brought to the desired depth. When necessary, the tractor, being fitted with a dozer blade, can be detached and used for spreading the deposited material. Experience has shown that these outfits are economical for hauls up to about 1,000 ft. or slightly more. However, this does not necessarily mean that their use is limited to cuts of this length. In one case, for instance, equipment of this type was employed successfully in a cut a mile long and having a maximum depth of 75 ft., this being made possible by constructing ramps up the side slopes at intervals to shorten the haul for the scrape-wagons.

It is recognized, of course, that the scrape-wagons are not applicable under all conditions, such as in ditches that are excessively wet or in cuts that are abnormally narrow. The small scrape-wagons of the type that are used in side-ditching work are generally about 6 ft. wide, and although this is somewhat wider than

the company's standard for side ditches, the unit cost of moving earth with this equipment has been found to be so low that it is still economical to use it even though more material is handled than may be required for good drainage. It has even been found economical in some cases to use the 8-*yd.* scrape-wagons, which have a width of 8 ft. 6 in., in ditching service.

As a result of the practice followed for many years of using the material obtained from side ditches to widen embankments, it has been found that in some instances the fills have acquired what might be called a "top-heavy" cross-section. One advantage of using the scrape-wagons in side-ditching work is that, with this equipment, such fills can be built-up from the bottom of the side slopes in such a manner as to correct the top-heavy condition. In connection with side-ditching and right-of-way drainage in general, the scrape-wagon outfits have also proved their worth as a means of constructing berm ditches along the tops of cut slopes and diversionary ditches at the ends of cuts, as well as other types of drainage ditches.

Cost Figures

Based on its experience to date, the Southern is convinced that the scrape-wagon outfits afford a highly satisfactory and economical means of performing side-ditching work where conditions are suitable to their use. The low unit cost of moving material in this service is indicated by figures for specific jobs. For instance, in May 1941, a Cletrac Model CG tractor operating a 3½-*yd.* scrape-wagon in side-ditching service moved 5,530 cu. *yd.* of material an average distance of 1,097 ft. at a total out-of-pocket cost of \$272.85, or \$0.049 per cu. *yd.* As itemized, these expenses included \$70.95 for gasoline, \$3.48 for oil and grease, \$48.34 for light repairs, and \$150.08 for labor. In the following month, this same outfit handled 7,077 cu. *yd.* of material an average distance of 858 ft. at a total cost of \$259.44, or \$0.037 per cu. *yd.* This expense included \$74.28 for gasoline, \$3.40 for oil and grease, \$13.34 for light repairs and \$168.42 for labor.

Aside from the scrape-wagon outfits, the Southern is also using other types of off-track equipment, such as crawler shovels and draglines, on ditching work in its efforts to reduce work-train service to a minimum. Units of this type are operated in cuts by supporting one tread on the shoulder of the roadbed and the other on a shelf in the side slope. Where draglines are used in this work, the excavated material is cast along the top of the slope if the cut is not too deep.



Many of the Tractors Are Fitted With Dozer Blades for Use in Smoothing or Spreading Work

With crawler shovels, the material is loaded into special trailers drawn by heavy-duty motor cars for disposal at the ends of the cuts or for widening embankments.

There are some locations, such as in narrow cuts, where off-track equipment cannot be operated readily, and it is still necessary to rely on the steam ditchers under such conditions. Also, this type of equipment, used in connection with dump cars, is still considered useful for certain operations, such, for instance, as the excavation of material for use in filling trestles.

Seven Outfits for Curve Work

Of the 18 scrape-wagons now owned by the Southern, 7 were acquired especially for grading work incident to curve-realinement projects, although these are, of course, available for use on any type of earth-moving operation for which they may be found suitable. These machines include the five 8-*yd.* and the two 6-*yd.* LeTourneau Carryalls. On curve-realinement and other jobs involving considerable grading, these machines are usually employed in groups of several outfits each, with the organization including a separate tractor for use as a pusher in loading the Carryalls and for spreading the material deposited in the embankment. Experience has shown that the most efficient and well-balanced organization is one comprised of four scrape-wagon outfits and one tractor with dozer attachment for pushing and spreading. The organization also includes one of the portable air compressors for inflating tires, and possibly a rooter if the character of the material to be excavated is such as to make its use necessary.

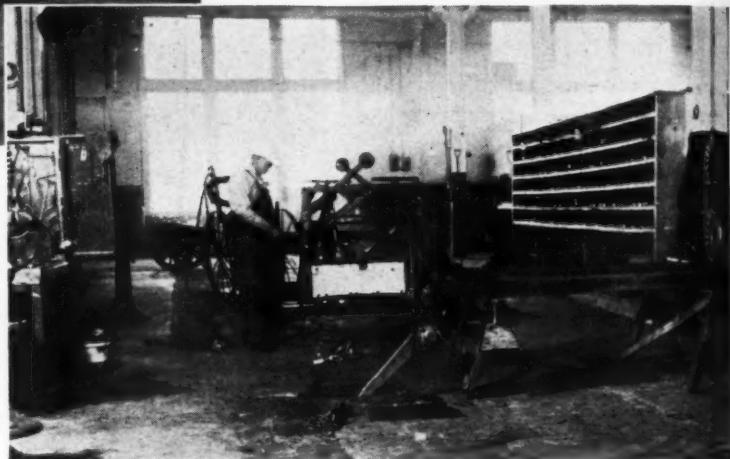
The use of the scrape-wagon outfits

on curve-realinement work can best be illustrated by describing a typical undertaking. For illustration, near Flippin, Ga., on the main line between Atlanta and Macon, a section of the old alignment, containing two 6-deg. curves in addition to other lesser curvature, and having a length of 6,003 ft., was replaced with an alignment embodying only two 2-deg. curves, with a much smaller aggregate central angle and having a length of 5,673 ft., or 330 ft. less than before. This project included 143,386 cu. *yd.* of grading, including the moving of 80,730 cu. *yd.* of excavation into embankment and 62,656 cu. *yd.* of borrow, which was obtained from a pit located in close proximity to the embankment. The equipment employed on this job consisted of two scrape-wagon outfits, each consisting of a Caterpillar D7 tractor drawing a LeTourneau 8-*yd.* (about 11 *yd.* when heaped) Carryall, and an Allis-Chalmers Model K tractor, with dozer blade, for pushing the Carryalls when loading and for dressing the embankment. One of the 2.7-*ft.* compressors was also used for inflating tires.

The grading for this undertaking was in progress from September, 1941, to May, 1942, and during part of the time the equipment was operated two 16-hr. shifts each day, using different operators for the two shifts. The total out-of-pocket cost of the grading was \$8,536.05 or \$0.06 per cu. *yd.* In contrast, it is interesting to note that the earthwork that was retired in connection with the line change had been charged to capital account at the rate of \$2.23 to \$0.40 per cu. *yd.* The total out-of-pocket cost of \$8,536.05 for the new grading included \$6,657.25 for labor, \$809.95 for fuel oil, \$1,007.76 for gasoline, and \$61.09 for motor oil and grease.



Above—A View of the Shop Looking Toward the Front. Right—Another View Looking Toward the Back. Machine in Foreground Is a Weed Mower, Being Repaired



IN September, 1942, the Chicago, Rock Island & Pacific decided to centralize all major maintenance of way work equipment repair work in a new system shop at Herington, Kan. Two months later a new shop with a light roomy interior and equipped with modern tools, many of them portable, was in operation. The primary purposes of this change were to set up a more efficient repair organization and to obtain uniform repair of work equipment, thereby increasing the efficiency of this work and obtaining longer service life from this equipment. In addition, the change has resulted in economies growing out of reduced material inventories and a centralized stock of repair parts.

Trend Toward Centralization

The construction of this system shop is the last step in a gradual change toward centralized supervision and repair of work equipment on this road. In 1920, the work equipment on the Rock Island was confined almost entirely to motor cars, with the exception of such on-track ditching equipment, as Jordan spreaders, steam ditchers and dump cars. Although the number of units and the diversity of types of work equipment steadily increased, until 1936, the maintenance and repair of the motor cars and smaller units of equipment was left entirely to the divisions in 20 motor car repair shops, each under a motor car repairman selected from the ranks of water service employees. This decentralization made for considerable confusion in standards of repair

and maintenance. In addition, since each division was responsible for its own equipment, it was the responsibility of the supervisory officers on each division to make the most efficient use of the equipment they had, with the result that equipment might be idle on one division at the same time that it could be used to advantage on another. Attempts to correct this condition under the supervisory setup existing at that time usually failed, because each division jealously guarded its own equipment and was not inclined to loan it except under direct orders.

Recognizing this condition, in 1936 the supervision of both the use and repair of work equipment was changed. In that year, three district maintenance of way shops were set up, one on each of the three operating districts of the railroad. These were located at Herington, Cedar Rapids, Iowa, and El Reno, Okla. At the same time a system supervisor of work equipment and district motor car inspectors were appointed, each of the latter in charge of one of the district repair shops and also of the inspection of work equipment in the field on his district.

Under this system, all of the larger units of work equipment, such as ditchers, pile drivers, cranes, etc., were pooled for the system. They

Rock Island

were assigned to the districts and maintained by them, but the system supervisor of work equipment could transfer the units to any point where they were needed most, always keeping in mind, of course, that certain types of units, such as pile drivers, must be kept within reasonable distance in case of emergency.

With the district shops set up for the repair of work equipment, and equipped with suitable tools, much better repair and maintenance were secured than formerly. Each shop worked from 6 to 9 men, depending upon the season. These men were selected from motor car maintainers or water service forces. At the time these districts shops were created, a new more accurate and efficient system was devised for keeping a record of each unit of work equipment.

More Work Equipment

About the time that the Rock Island changed to the district shop system, this road also began to greatly expand its purchase and use of work equipment of all kinds. In the seven years from 1937 to 1943, inclusive, approximately 1,000 units of work equipment were purchased.

With the advent of many new types of work equipment, some form of

Builds System Shop

For Work Equipment Repairs

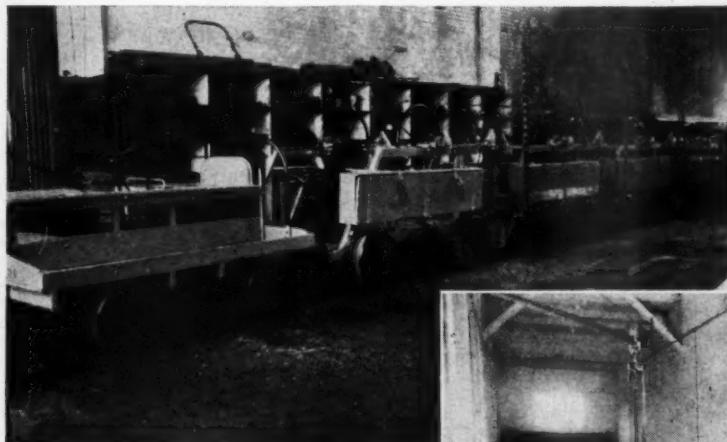
Obtains better and more uniform work at less cost by overhauling all maintenance machines at one central point in a new and modern shop

centralization became necessary and, while the new district set up constituted a great improvement over the former system, it was not entirely satisfactory. The standards of repair and maintenance were not yet uniform. The various district shops were not completely equipped with modern tools to do all types of work and the work could not be set up on a most efficient basis. In addition, the three shops each required stocks of

installed in four stalls of the enginehouse made available for this purpose. These stalls and others for the storage of repaired machines awaiting shipment and machines awaiting repair, as well as space for a new storehouse were made available by revamping and modernizing the terminal. The four stalls of the new shop are located on the east side of the turntable, seven stalls from the north end of the enginehouse. A brick fire wall sepa-

rates them from the seven stalls used for storage, and a wooden partition was constructed to separate the shop from the rest of the enginehouse.

The four stalls comprising the new shop provide an area 102 ft. long, 61 ft. wide at the west, or turntable end and 103 ft. wide at the back, or east end. One track with a pit was left in place alongside the fire wall on the north side. The other tracks were removed within the enginehouse, the pits filled in and a new cement floor was placed. The back, or east wall, of the enginehouse has large glazed windows, extending almost to the roof, which provide ample light. In addition, there are skylights in the roof. The stall doors were removed in the west wall, which was boarded up to conserve heat. Three windows and three doorways were installed in this wall. One double door, 13 ft. high, provides entrance on the pit track for large units of work equipment. A smaller door at the other side of the shop provides entrance for smaller equipment and doors at the front and back of the shop provide



Left—Heavy-Duty Motor Car and Weed Mowers Ready to Be Shipped After Repairs. Below—a Front-End Loader, Two Compressors and a Heavy-Duty Motor Car on the Pit Track



repair parts and centralization would save inventory. Accordingly, after considerable study, it was planned in September, 1942, to set up a system work equipment repair shop at Herington, which is central to the system, bringing the best tools and equipment from each of the district shops to equip one complete, modern shop.

The new shop at Herington was

for entrance and exit of employees.

The interior of the shop is entirely open, except for the roof columns, an enclosed office with windows overlooking the shop in the middle of the east wall, a toilet and wash room in the southeast corner and a paint spray enclosure in the southwest corner. The walls, ceiling and columns are painted white above a level six ft. from the floor. Below that level the walls and columns are painted black.

Shop Equipment

The shop has a 440-volt power line and 110-volt lighting and outlets. Three rows of drop cords are placed between the columns for ample lighting and electrical outlets are placed conveniently along the walls and on the columns. The shop also has a live steam line with 80 lb. pressure and an air line with 150 lb. pressure.

Practically all of the equipment in the shop is portable or is so arranged as to provide maximum flexibility of operation. Four swinging cranes were installed. Two of one-ton capacity are installed on columns on the south side of the shop and can handle equipment in either of the two south stalls. The other two, a 1-ton and a 1½-ton crane, are located on the north row of columns and serve the two north stalls, including the pit track. The shop is equipped also with a portable ½-ton crane with welded frame of pipe and three pneumatic tires.

In addition to the above equipment, the shop is provided with two portable welding outfits, an oxy-acetylene outfit and a 150-amp. electric welding motor-generator outfit; two electrically operated drill presses, with a complete set of bits; one Gardiner electric tool grinder with two seven-inch wheels; four Black & Decker portable electric drills; one Black & Decker buffer with a wire brush; one 14-in. band saw for cutting wood (brake shoes, etc.); one Mall power hand saw with a 12-in. circular blade; six machinist's vises; six engine stands for repairing small motors; a battery charging outfit; a magneto recharger; a De Vilbiss paint spray gun and bucket (air from the shop line is used); an Ammco rigid cylinder grinder (honing outfit); and individual work tables and lockers for hand tools for each mechanic. The shop is also equipped with work benches along the walls and, with bins, located between columns, containing hardware and small quantities of frequently needed repair parts, such as bolts, nuts, bushings, etc.

This equipment was all secured from the three district shops, without the purchase of any new units, although some additional equipment has

Railway Engineering and Maintenance

been ordered more recently, including another paint spray outfit and a Black & Decker valve grinder.

Equipment to be repaired is usually brought in over the turntable and through one of the doors in the west wall, or through a fire door in the north wall between the shop and the storage stalls. Heavy equipment is placed on the pit track, cleaned with steam, and dismantled there, the cranes swinging the parts over into the next stall, as needed, for repair work. Lighter equipment is usually brought in through the other door and rolled across the floor, or carried by the portable crane, to the south stall



The ½-Ton Portable Crane

where it is cleaned, dismantled and repaired. The adjacent stall is usually kept open for traffic.

Organization

The shop at Herington is under the jurisdiction of the district motor car inspector and has a normal force of 11 men, including 7 mechanics and 4 helpers. One man is assigned to painting work and the others generally work in pairs, a mechanic and a helper doing all the work of dismantling and repairing each machine assigned to them. Occasionally, one man will do all the work on some of the smaller units, or, in emergency, more men will be assigned to a large unit. In this manner, from five to seven units of equipment are usually undergoing repairs at any one time.

All of the equipment brought in for major repair, except some of the heavier units, is completely dismantled. The mechanic takes the engine and overhauls it while the helper starts working on the frame, axles and bearings. Everything is taken apart, cleaned and reassembled. If new parts are needed, the mechanic gets them from the storehouse, located at the other end of the enginehouse,

usually making a list each night of the parts needed for the following day's work and sending the helper over with a cart just before the close of work each day. All old parts are put in a bin and examined by the district motor car inspector to see if they can be rebuilt or reused before they are scrapped. Generally, parts that can be welded or otherwise repaired are fixed and reused. This can frequently be done by building up with welding and, if necessary, sending the part in to the mechanical department for planing or machining. However, no effort is made to build entirely new parts, as this is considered uneconomical, the only exception being the wood frames for push cars which are made at Silvis, Ill., and stocked by the stores department.

After reassembling, all motors are given a test run, all equipment is operated to insure that it works properly, and gage and wheel alignment are checked. The equipment is then painted and shipped out.

This system of complete dismantling and repair is followed for nearly all of the equipment that is sent in, except some of the larger units, which get frequent inspection and are assigned to highly qualified operators in the field. In such equipment, the operator's reports usually provide a reliable indication of what is wrong and dismantling may not be necessary.

Large Volume of Repairs

The new shop was started in December, 1942, and in one year of continuous operation (1943) its force of 10 men (one less than the full complement) turned out a surprising volume of repair work, which is evidence of the efficiency of this shop. A list of the equipment overhauled in 1943 is as follows:

310 motor cars of all kinds
82 motor car engines
73 push cars
27 extra-gang trailer cars
16 adzing machines
13 air compressors
3 adzing machine bit grinders
21 bolting machines
3 concrete busters
1 concrete mixer
10 ballast discing machines
1 electric power track drill
4 paint spray machines
2 power ballaster machines
2 Nordberg power units
11 rail laying cranes
1 electric rail saw
2 pneumatic chain saws
1 Woolery tie saw
3 Jackson electric tampers
3 Nordberg track shifters
11 Fairmont oven-type weed burners
1 Woolery weed burner
23 weed mowers
4 weed spray machines (for spraying distillate and creosote)
4 Jacobsen hand-operated power mowers
2 tractors equipped with angle dozers

4 shop trucks
29 magnetos, for replacement in the field
1 concrete vibrator
3 rail grinders (4-wheel heavy-duty)
1 rail grinder, portable
2 creosote tie spray machines
3 draglines, crawler type

In addition, this shop dismantled 41 motor cars, repaired 67 motor car wheels for replacement in the field, refaced 32 tamper shoes and rebuilt 10 extra transmissions for weed burners, spray cars and heavy-duty motor cars.

There are three types of work on work equipment that the shop does not do. Repairs of large units of on-track work equipment, that are fitted with couplers, and operated in train service, are made by the mechanical department. Repair of large crankshafts that require machining is handled at the general system shops at Silvis, Ill., and large car wheels and axles are sent to Armourdale, Kan., to be fitted on a big press. In addition to the repair of all other equipment, most newly purchased units of work equipment are sent to the Herington shop to be assembled and checked to insure that they are oiled and adjusted properly before being put in service.

District Shops

The establishment of the system shop did not do away with the two other district shops at Cedar Rapids and El Reno. These shops now employ from 2 to 3 men in light motor car repairs and occasionally for emergency repairs. The total number of men engaged in work equipment repair work formerly varied from 18 to 27. Now 14 to 16 are so engaged the year around and do more and better work. The three district motor car inspectors are still responsible for the field repair and inspection of the equipment on their districts. They also schedule the shipment of equip-

Railway Engineering and Maintenance

it to and from the shop at Herington in carload lots, the new system has proven a big time-saver. By this method equipment frequently arrives at Herington by fast freight in less time than it used to take to ship units to the district shops by local freight.

Savings in Inventory

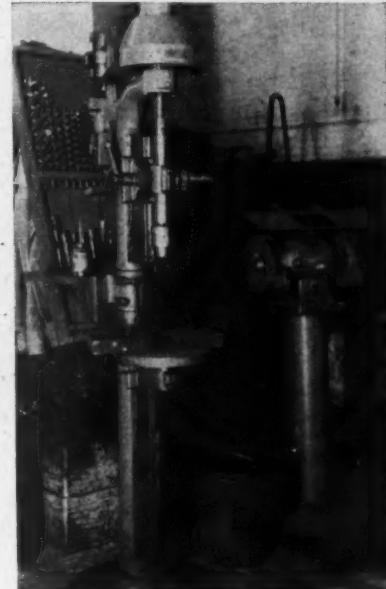
In addition to more efficient repair of the work equipment, large savings have been realized in reduced inventory and surplus equipment. As soon as it was decided to establish a system shop, an inventory was made of all work equipment repair parts and stores, which were moved to Herington. A new standard was set up for the amount of stock to be carried on hand, which was less than one-third of the amount of stock previously carried at the three district repair shops. At the time the system shop was established, a new division storehouse, largely for maintenance of way work equipment repair parts was established in the three westerly stalls of the enginehouse at Herington. This location was convenient to the repair shop and a stock of nearly all parts needed for repair work is kept at this point. This stock is maintained, so far as possible, at a level consistent with the volume of work done by the work equipment shop. The maintenance of a stock of repair parts has been especially important recently, because war conditions have made it more difficult to get orders for parts filled promptly and in a few cases it has been almost impossible to obtain new replacement parts.

Surplus Motor Cars

In addition to a reduction of the inventory for repair parts, it was discovered after a large number of motor

cars to and from the shop at Herington in carload lots, the new system has proven a big time-saver. By this method equipment frequently arrives at Herington by fast freight in less time than it used to take to ship units to the district shops by local freight.

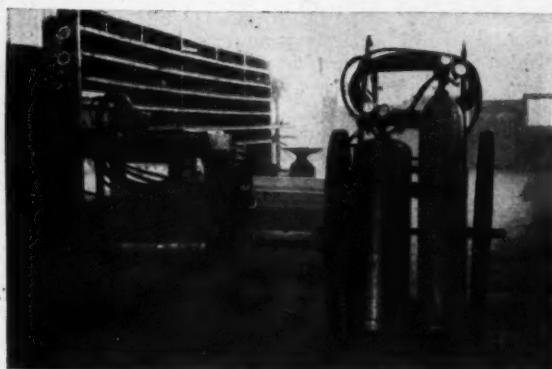
ter's territory. The discovery of this surplus and new purchases enabled a considerable number of old or obsolete cars to be dismantled or scrapped, saving reusable parts for replacement in other cars still in service. If repairs cost 60 per cent or more of the original cost, it has long been the practice, when repairing motor cars, to scrap the car and salvage any usable parts. This rule is also followed



Close-Up of the Grinder and One of the Drill Presses

largely with other equipment although it has been modified somewhat of late due to wartime conditions and much equipment is now being carried over which would ordinarily be junked. In any case, no unit of work equipment is destroyed or junked without the approval of the system supervisor of work equipment.

The Rock Island has been more than pleased with the first full year of operation of its new system work equipment repair shop and with the exception of the purchase of the few additional tools previously mentioned and the installation of two more swinging cranes, no further changes are contemplated. The planning of this shop and the changes in system work equipment practices were developed under the direction of W. H. Hillis, operating officer, C. H. Hardwick, engineer maintenance of way, L. J. Turner, former supervisor of work equipment (now on leave of absence), and F. A. Williams, present supervisor of work equipment, all of Chicago. George S. Douglass, district motor car inspector, Herington, was in charge of the establishment of the new system shop and is in charge of its operation.



The Portable Electric and Oxy-Acetylene Welding Outfit Used in the Shop

ment to Herington for general overhauling, subject to the approval of the system supervisor of work equipment.

By scheduling the systematic repair of all work equipment and by shipping

cars had been overhauled on two districts, that these districts then had a surplus of motor cars, over and above the normal emergency surplus of one section motor car on each roadmas-



FACED with almost continuous shortages in both labor and materials since the entry of the United States into the present war, while at the same time confronted with rapidly expanding programs of necessary roadway and structures maintenance work, maintenance officers in all parts of the country have found their power tools and work equipment essential to the adequate upkeep of their properties. In fact, most of them feel that without this equipment it would have been absolutely impossible for them to have kept pace with the exacting requirements to date.

Prior to the last few years, work equipment was looked upon primarily as a means of reducing the physical energy required in otherwise arduous maintenance tasks, of improving the quality of the work performed, and of effecting economy in carrying out this work. During the last two war years, at least, while none of these advantages have been overlooked, the paramount end sought has been maximum production—the maintenance of maximum strength, stability and safety in the fixed properties—with the limited manpower and materials available.

With this consideration in mind, road after road has purchased more work equipment during the last few years, war-time restrictions on some units to the contrary, notwithstanding, than in any previous years. Furthermore, they have endeavored to maintain and utilize all of their equipment to the fullest extent.

During recent years, maintenance of way men have been faced with increasing problems. Freight traffic handled by the railways, measured in gross ton-miles, rose from approximately 1,084,643 million in 1937 to more than 1,900,000 million in 1943. In this same period, revenue passenger miles rose from 24½ billion, to approximately 85 billion.

Following the depression period, with its necessarily restricted maintenance operations, this huge increase in traffic volume not only required that immediate steps be taken on most roads to bring the various elements of their fixed properties up to normal strength, but that unusually large programs of maintenance be carried out currently to offset the unusually heavy current wear and tear. At the same time, each progressive increase in traffic density, through increased interference with maintenance operations, made it more difficult to carry out these enlarged programs and decreased materially the effective output of the maintenance forces.

What the maintenance forces have been able to accomplish in these years is possibly shown best by the fact that, whereas total annual maintenance of way and structures expenditures on the railways averaged approximately \$469,900,000 in the four years 1937 to 1940, inclusive, immediately preceding the sharp up-turn due to war traffic, they were \$603,088,000 in 1941, reached \$796,358,000 in 1942, and further increased to approxi-

Is "Saving For

mately \$1,070,000,000 in 1943. They averaged \$823,149,000 for the latter three years, or approximately 75 per cent more yearly than the average expenditures for the years 1937 to 1940, inclusive. In these largely increased maintenance expenditures of the last three years are included such items as the laying of 3,800,000 gross tons of rail and the installation of more than 141,800,000 crossties in replacements.

To carry out such programs, the railways, of necessity, increased the number of their maintenance of way and structures employees, and especially the man-hours worked by these employees. In the four years 1937 to 1940, the yearly average number of such employees was 207,042. During the last three years this number reached approximately 258,431, an increase of about 25 per cent. At the same time, the total number of man-hours of maintenance labor worked in the four earlier years averaged approximately 487,105,000, compared with approximately 662,217,000 in the latter three years, an increase of about 36 per cent.

Output of Labor Down

Interesting as these figures are, they present an exaggerated picture of the increase in maintenance of way and structures activities during the last three years. To gain a more accurate picture of the actual work done, one must take into consideration the higher basic wages of employees during the last three years, the large percentage of overtime pay paid, the smaller output of labor per man-hour due to the inexperience of thousands of new employees, the greater interference of traffic with work operations, and the unbalanced programs of work occasioned by the inability to secure specific essential materials, or the labor necessary to install these materials.

The indicated increase of 36 per cent in man-hours of labor is particularly misleading. Since the onset of the war, the railways have lost many thousands of experienced maintenance

The Day" Maintenance Men

They latter 75 per cent average 1937 to 1938 of 1 such gross tonnage in 1937, the 1937 number of way espe- these 1937 number Dur- number an in- at the man- worked d ap- paried in the e of

of way employees to the armed services or to other industries. To replace these men and to increase the size of their forces, it has been necessary for them to hire men with little or no experience in track work, and to raise the age limit of those hired. In addition, they have employed large numbers of high school boys weekends and vacations. Furthermore, some of them have employed Mexican Nationals to the extent that they have been available. Some have employed a considerable number of women in the lighter maintenance of way operations in and around terminals, and a few have employed Japanese and Italian internees, and a considerable number of white-collar workers on a part-time basis.

Due largely to the inexperience of most of these newer employees, their man-hour output has been only 50 to 75 per cent of that obtained normally from experienced section and extra-gang laborers. Giving consideration to this factor, it would be more nearly correct to place the increase in maintenance of way manpower on the railways during the last three years at approximately 20 or 25 per cent, and then reduce this figure still further to compensate for the increased unpro-

ductive time of these forces due to the greater interference to their work from increased traffic.

Furthermore, the labor that has been available has been unequally distributed along individual lines, ranging from small surpluses in some areas to critical shortages in many others. This situation has been complicated further by the fact that much of the labor that is local to the railways is, to an increasing degree, refusing to live in permanent camps and in camp cars. The men insist on living at home.

This situation has reached such proportions on some roads that they have had to abandon almost entirely their former practice of building large division or district gangs for major track maintenance operations, and, in lieu thereof, have had to bunch section gangs and truck extra laborers to and from the site of their work daily so that they can be home at night. This, in turn, has revolutionized large work organizations that have been built up in recent years around power tools and units of work equipment to the point of peak efficiency. For example, some roads that, until recently, laid their rail with fully mechanized gangs of 100 to 150 men or more, found it

This article analyzes the problems that have confronted the maintenance of way and structures forces of the railways since the onset of the war and points out the important part in the solution of these problems that has been played by their growing volume of power tools and work equipment. Without this equipment, it is estimated that the railways would have required 25 to 30 per cent more maintenance of way employees in 1943, at a time when existing shortages on most roads would have made such increases impossible

difficulty in 1943 to build up rail laying gangs as large as 25 to 30 men, and succeeded in this only by bunching section gangs and by hauling to and from work such extra laborers as could be hired in nearby communities. To more or less the same extent, the same difficulty was experienced by many roads in organizing large tie renewal and ballasting gangs.

Equipment More Essential Than Ever

In the face of such difficulties and largely increased work programs, the railways have found their growing volume of power tools and work equipment of greatest help. There is no disposition among maintenance officers to admit that there would have been a complete breakdown in their maintenance programs in 1943 if it had not been for the assistance received from their power equipment. Rather, they feel that some adjustment in the manpower situation of the country—under compulsion, if necessary—would have enabled them to enlarge their forces over what they were

Power Tie Tamper of Various Types Are Saving From 50 to 60 Per Cent in Man-Hours, While Producing More Uniformly Tamped Track





No One Would Attempt to Estimate Accurately the Man-Hours Being Saved Annually by the 52,000 Motor Cars on the Railways

in that year, offsetting to some extent the advantages gained through their work equipment. However, they are prompt to admit three conclusions of fundamental importance in this regard: First, if it had not been for their work equipment in 1943, the number of maintenance of way and structures employees in that year would have had to be increased at least 25 or 30 per cent over what it was; second, that without such an increase in labor, much of the essential work that was done would have had to be deferred; and third, that, regardless of the amount of manpower that might have been available, the quality of much of the work performed without the aid of equipment would have been of lower standard.

Large Volume of Equipment

No complete list of the work equipment being employed on the railways as a whole is available, but it is estimated that the total railway investment in such equipment at present is at least \$120,000,000. During the last six years alone, the railways purchased more than 34,000 units at an estimated cost of approximately \$50,600,000, this including the record purchases of 8,500 units in 1943, at a cost of about \$12,300,000.

A current list of the equipment being employed by the railways, as compared with a list of the equipment they had in 1937, would show not alone the largely increased volume of such equipment available to the maintenance forces during the last six years, but of equal interest and importance, a considerable number of entirely new types of units, including tie saws, new types of tie tampers, a large number of portable woodworking tools, and a wide variety of power grading equipment, indicating entirely new methods of performing work. One thing of importance that such a comparison would not show, would be

the extent to which many of the units available in 1943 were superior in design and efficiency to units of the same general type in 1937. It is a known fact that improvements have been made in practically all of the equipment purchased by the railways since 1937—these improvements in some cases doubling or tripling the efficiency of the units.

Largely Increased Production

What have the large purchases of work equipment in recent years meant to the railways? From the overall standpoint, the picture is best seen in the figures already presented of total expenditures for maintenance of way and structures, of the average number of maintenance of way employees, and of the number of units of equipment purchased since 1937. These figures show that while 34,000 units of work equipment were purchased for re-

placements and to increase the mechanization of work operations in these six years, the output per employee, measured in total expenditures for maintenance of way and structures work (without giving any consideration to the smaller output of many employees in 1943, due to inexperience), increased from approximately \$2,140 to approximately \$3,890.

The degree to which the railways have increased production through the use of their work equipment can be demonstrated readily by analyzing the operations of almost any one of their power tools or machines, even though the efficiency of many of these units has decreased materially because of the smaller organizations made necessary by labor conditions during the last year or two. It is obvious that a modern rail crane with an operator and three men to heel in new rail will replace 20 to 24 men required to handle 112- or 131-lb., 39-ft. rail with tongs, and will handle far more rail in a day; that each modern spike pulling machine operated by three men will do the work of 14 to 16 men with claw bars; that each tie adzing machine will equal the production of 8 to 10 men with hand adzes; that each power spike driver will drive as many spikes as 4 to 6 men with mauls; and that each power bolting machine will do the work of 8 to 10 men with hand wrenches.

Combined in the large, highly-organized rail laying gangs employed by many roads, it is an established fact that this equipment has at least doubled the production possible by an equal force of men working exclusively with hand tools. Under existing conditions, which have made it necessary for many roads to lay their rail with much smaller organizations, the efficiency of the individual machines is considerably reduced because of their less intensive use. But this is likewise true of the men in the gangs, who are less efficiently employed in such gangs, so that the equipment still doubles the otherwise unaided production of the men in these gangs.

Similar increased production per man-hour can be shown with practically every item of work equipment used by the maintenance forces. It has been demonstrated beyond question that the employment of tie saws in suitable gang organizations will increase the rate and economy of tie renewals at least 30 per cent over the digging-in method, and that power tamping outfits of the unit, pneumatic and electric types are saving from 50 to 60 per cent in man-hours for surfacing, while at the same time producing more uniformly tamped track.

(Continued on page 253)



Modern Power Grading Equipment is Doing the Work of an Army of Men

New York Central

Mechanizes

Its B. & B. Forces

The extensive use of power machines by bridge and building forces of the New York Central is recognized as necessary if these forces are to function with maximum efficiency and economy. From the time that power equipment suitable to their work first became available, this company has made it a practice to provide its bridge and building gangs with the most modern machines obtainable. This article traces the introduction of such equipment on this system, with special emphasis on small hand-held power tools that represent the latest development

THE mechanization of the bridge and building forces of the New York Central System has been under way for many years. In recent years this trend had been accelerated by the introduction and increasing popularity of various types of portable hand-held saws, drills and other tools which, it had been found, could be applied with resulting economies and other advantages, to a wide range of tasks that were formerly performed laboriously by hand methods.

A Continuing Program

The company is fully awake to the advantages of mechanizing these forces and it is planned, as rapidly as conditions permit, to make every effort to supply them with all the power equipment that can be used to advantage. Moreover, while the smaller types of power tools mentioned above have received the greatest attention in recent years, it should be emphasized that this is only one phase of the program and that full advantage has been taken of the many other types of machines and equipment that are applicable to the tasks of bridge and building forces.

The New York Central System

As Shown at the Right, Power Wood Augers, Impact Wrenches and Two-Man Chain Saws Are Included Among the B. & B. Power Tools on the System



that there should be some variation in details between different territories in the extent to which the bridge and building forces have been supplied with power equipment. Generally speaking, however, the practices are uniform, and for this reason, it is possible to present a broad picture of the extent and manner of mechanization throughout the entire system.

In general, the bridge and building forces on this system are organized on a division basis, there being no system, regional or district gangs. Ordinarily, each division has at least one, and possibly several, carpenter gangs, consisting frequently of separate crews for bridge work on the one hand and building work on the other. Also, the division forces normally include at least one steel-bridge repair gang, a masonry gang and a paint gang, as well as such roofing, tinsmith, and plumbing forces as necessary.

Started With Steel Gangs

From the beginning, it has been the practice of this company to supply its bridge and building forces with available types of power equipment that can be employed to advantage either to promote economy or to improve the quality of the work, or both. Probably, as on other roads, it was the steel gangs that first began to benefit by the process of mechanization, due to the fact that the introduction of pneumatic tools, such as riveting hammers and allied equipment, suitable for use by such gangs, antedated by some years most other types of power equipment that are used by the bridge and building forces today. An indication of the eagerness with which the availability of power tools was welcomed by the system, even in the early years, is shown by the fact that, before portable air compressors were developed, it was frequently the practice to use an air pump taken from a locomotive, and driven by a portable steam boiler, to provide the necessary compressed air to permit the use of pneumatic tools in steel repair and fabrication work. Ultimately, of course, these makeshift outfits were replaced with modern portable compressors.

Other types of power equipment that were supplied to the bridge and building forces of this system as they became available included motor cars, cranes and pile drivers, pumps, concrete mixers, electric arc-welding units, portable grinders, oxy-acetylene cutting outfits, and various types of stationary wood-working tools, such as circular saws, bandsaws, planers, joiners and mortising machines, which were installed largely in the division carpenter shops. However, there was

Railway Engineering and Maintenance

an early appreciation of the economies and other advantages to be derived through the availability at the site of the work of power-operated wood-working equipment. This is shown by the fact that, as early as 1927, the road had in operation on at least one division a portable power-operated



Above—Drilling Holes in a Steel Plate with a Pneumatic Drill. Below—A Portable Electric Drill in Use in the Field

wood mill in the form of a baggage car equipped with a gasoline-engine driven wood-working outfit. While possessing obvious advantages, this outfit still did not fill the recognized need for power tools that could be used directly on the job and shifted about as necessary.

New Possibilities

About this time the portable air-driven one-man circular saw and the two-man chain saw were introduced, and the availability of these tools, together with the perfection of the portable gasoline-engine driven air compressor, presented new possibilities for mechanizing bridge and building work. On the New York Central these possibilities were recognized immediately, and numbers of the saws, and of such tools of earlier development as wood augers, were acquired. With the onset of the depression, the need for economy in all types of work became more pressing, and as a result there was an acceleration of the trend

toward the use of portable pneumatic tools, as well as other types of power equipment.

This trend has now progressed to the point where most of the carpenter gangs are equipped with a pneumatic hand-held circular saw and a wood auger, and, in addition, most divisions have at least several two-man chain saws which are available for assignment as needed. A later development was the pneumatic impact wrench, which the New York Central has found to be useful for a wide variety of bolting operations, especially where it is necessary that the work be done rapidly, or where there is a considerable amount of it to be performed. As a consequence, most of the steel gangs and many of the heavy carpenter gangs are supplied with this tool and others are available for assignment to other gangs as required.

It should be noted here that, so far as practicable, it is the policy of this company to preframe all treated timber before treatment. However, practical considerations place certain limitations on this policy, preventing, for instance, the preboring of the sway bracing for timber trestles or the timber guard rails for bridges, which still leaves considerable work to be performed in the field, even where treated timber is used.

Electric Tools

One of the more recent developments on the New York Central in connection with the mechanization of bridge and building forces is the introduction of hand-held electric-driven circular saws and drills operated from portable electric generators. Prior to the introduction of portable generators, electric tools were in wide use on such jobs as building repair work, where electrical connections were available. When the portable generator became a reality, the road began to acquire these units primarily for the purpose of providing electric power for illumination in connection with emergency work at night. With portable generators available, the acquisition of electric tools for use with them was a natural development. Since the first generators were acquired especially to provide illumination, these were of the smaller sizes. More recently, the generators purchased have been somewhat larger in order that they will have the necessary capacity for operating portable tools.

Most of the divisions on this road now have at least several portable generators and these, together with the tools for use with them, are assigned to the various gangs as needed. Aside from their use by field gangs,

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The Working End of the Car, with Table Saw and Jointer in Foreground, Band Saw on the Left and Drill Press on the Right.



Power Tool Cars Speed Building Work on the Frisco

For the use of its carpenter gangs, the St. Louis-San Francisco has equipped four cars with power wood working machines and portable tools of various types. These cars have proven very efficient in building repair and construction work and have paid for themselves in less than two years. In addition, they have enabled this road to do much more building repair work than would otherwise have been possible with present labor and material shortages.

FOR several years the St. Louis-San Francisco has been expanding the use of power tools in bridge and building work, equipping its bridge gangs with power units and portable tools and its carpenter shops at terminals with power wood working tools. More recently, it has developed four carpenter gang power tool cars for the use of house gangs on the four most important of the seven divisions on the system. These so-called house gangs do bridge work only in emergencies, being assigned normally to building repair and construction exclusively.

Briefly, each of the carpenter power tool cars is equipped with a motor-generator, table saw, 6-in. jointer, band saw, drill press, paint sprayer, portable power saw, belt sander, disc sander, bench grinder, machinist's vise and many accessories which enable the gangs to make from unfinished lumber practically every article required on a job, including doors, windows, sash, etc. In addition, the cars have enabled the gangs to do a large amount of work with a small force.

The use of this car has eliminated the practice of sending a man out in advance to measure a structure and order the material necessary for its repair. It has also eliminated the delays involved in securing special sash, doors, etc. from commercial millwork concerns, which, under present conditions, permits work to be done which in some cases might not be done at all, since special millwork is becoming exceedingly difficult to obtain.

The idea of building the carpenter gang power tool cars originated in 1940 and after two plans had been considered, the ideas were consoli-

dated into one plan and two cars were built in 1941. These two cars proved so successful that two more cars were built in 1943 with only minor improvements. These improvements consisted of more and larger window openings for natural light, more wall outlets, slight changes in the location of drop cords for overhead lighting and the equipping of the cars with snubbers to protect the machinery from shock while traveling. In other respects, including the interior arrangement and the types of equipment and tools furnished, all four cars are practically identical.

Interior Arrangement

All of the carpenter power tool cars are 40-ft. wooden cars with steel underframes. An extra wooden floor of old car siding was placed over the original floor to provide a firm base for the machinery, the ceilings of the cars were insulated and four double-sash windows were installed. The cars have 6-ft. sliding doors in the center on each side, and 2½-ft. doors at each end, so located that long pieces of lumber can be handled convenient-

ly into and out either end of the car.

In the center of the car, the table saw and jointer are mounted nearly side by side. For convenience in description, the car will be divided into two parts, the power end and the working end. With the exception of the table saw and jointer, all of the power equipment, tools and work benches are located along the walls on each side in the working end and the power unit, stove, coal bin, lumber rack and trash barrel are located along the walls on each side in the power end of the car. The arrangement is very convenient and, except for starting the power unit or selecting timber from the lumber rack, the operator can do all work required, moving from one machine to the other, by taking only a few steps.

Standing at the table saw and looking toward the working end, the band saw is located on the left just beyond the doorway. Beyond the band saw is a work-bench, with a machinist's vise on the near corner and the power grinder at the far end. Beneath the work-bench is an enclosed storage space, in which the power hand saw, the belt sander, the disc sander and the paint spray outfit are kept when not in use. Just beyond the work-bench in the corner of the car is a

locker for clothing. The drill press is located on the right side of the car, just beyond the doorway and in the right corner are lockers and bins for accessories, parts and small hand tools.

Standing at the table saw and looking toward the power end, the lumber rack is located on the left. On the right, just beyond the door is the trash barrel, then the stove, coal bin and power unit, in the order named.

Description of Equipment

All of the fixed power tools in the car are Delta equipment, while the portable units are of various makes. The table saw has a 10-in. circular blade, and is powered by a 1-hp. 120-volt single-phase motor. It has a tilting table equipped with a rip fence and mitre gage and has rip, cross cut and combination saw blades. Other accessories include a cutter set for cutting special moldings, quarter round, etc. Cutter blades have been made also for cutting special jobs in one operation, including a set for cutting out a complete window sash, including the niche for the glass and putty. The table saw is also equipped with standard heavy-duty Dado heads for making grooves from $\frac{1}{8}$ in. to $1\frac{1}{16}$ in. wide and up to $1\frac{1}{4}$ in. deep.

The jointer is powered with a $\frac{3}{4}$ -hp. motor. It can be used for ordinary planing of all kinds up to a width of 6 in. and rabbeting for any width up to 6 in. on any angle up to 45 deg. and any depth up to $\frac{1}{2}$ in. A large proportion of the work is done by the table saw and jointer. Both of these units, which occupy the center of the car, are mounted on heavy steel stands bolted to the floor. These

stands are of welded design and were made by the car department of 2-in. by 2-in. by $\frac{1}{4}$ -in. steel angles for the legs, with a $\frac{1}{4}$ -in. steel plate top.

The next most important tool is probably the 14-in. drill press, which is mounted on a welded steel stand bolted to the wall and floor and is driven by a 1/3-hp. motor. It is equipped with a complete set of drills from $\frac{1}{8}$ in. up to $\frac{1}{2}$ in. It also has $\frac{1}{4}$ -in., $\frac{3}{8}$ -in. and $\frac{1}{2}$ -in. mortising tools; plug cutters, for making dowels, etc., from $\frac{3}{8}$ in. up to 1 in. in diameter; shaper attachments for making small moldings, quarter rounds, etc.; and a set of router bits from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in diameter.

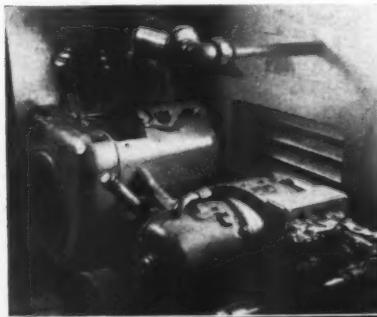
The band saw is of the 14-in. size and is powered with a $\frac{1}{2}$ -hp. motor. This saw is equipped with $\frac{1}{4}$ -in., $\frac{3}{8}$ -in., $\frac{1}{2}$ -in. and $\frac{3}{4}$ -in. blades for various types of sawing, depending upon the sharpness of the curve and the thickness of the wood. This unit is also mounted on a welded steel stand bolted to the floor.

The grinder is mounted on the work-bench and has two grinding wheels 7 in. in diameter, with a maximum width of 1 in. It is equipped with lights, glass safety shields and rest plates that can be set at any angle for sharpening various tools. In addition, various stones are available for different types of grinding work, including one for gumming saws. This unit has attachments for holding tools at the correct angle when being sharpened. A homemade accessory was also made for the grinder, consisting of a wood block 7 in. in diameter with a $2\frac{1}{2}$ -in. sanding belt on the side, which is used as a disc sander for polishing tools.

The portable tools include a 3-in. Skilsaw belt sander, which has belts of various sanding grits from fine (00) to coarse. In contrast with many belt sanders, which can only get to within $1\frac{1}{2}$ to 2 in. of a corner, this sander can be used to sand directly into a corner because the belt on one side is flush with the side of the tool. A Black & Decker disc sander is also part of the equipment of the car.

A Thor portable electric saw with a 12-in. circular rip saw blade is used for hand ripping and also to reduce some of the large timbers before finishing them on the table saw or jointer. This saw will cut timbers up to $4\frac{1}{2}$ in. in depth and can be set for any angle of cut from 90 to 45 deg.

The paint spray unit is a small Sears-Roebuck machine, consisting of a two-cylinder compressor with a capacity of 5 cu. ft. per min., powered by a $\frac{1}{2}$ -hp. motor. It has a maximum pressure of 50 lb. and a working pressure of 35 lb., a one-pint pot and 15 ft. of air hose of $\frac{1}{4}$ -in.



Above—Close-up of the Power Unit. Below—The Power End of the Car, with Jointer and Table Saw in Foreground. The Power Unit is Located in the Corner Behind the Stove

inside diameter. In addition to painting work, this outfit is also used to blow sawdust out of the motors.

The car is also equipped with two portable rollers, adjustable as to height, for supporting the ends of long pieces of timber on and off the table saw or jointer with which pieces 18 to 20 ft. in length can be handled.

Power Unit

Power for all the equipment and tools in the car and for lighting is furnished by a WS-8 portable Jackson power unit. This unit has two wheels and a pedestal type leg. It is bolted to the floor but can be removed for use in emergency work or as a power unit for the portable tools when it becomes necessary to use them at points remote from the car. It has a Wisconsin-type VE-4 engine of about 12 hp. capacity and a generator with an output of 5 k.v.a. of 120-volt, 60-cycle a-c. current with both 3-phase and single-phase outlets. This power plant has sufficient capacity to operate all the power equipment in the car at the same time.

The car is completely wired with rigid conduit, with four drop cords from the ceiling for lights and with conveniently-located power outlets on the wall, particularly above the work-bench. A total of 100-ft. of extension cord is provided to permit using portable tools a short distance away.

Operation

The carpenter gang with a power tool car consists of a foreman and ten men. Their outfit, in addition to the power tool car, usually consists of seven other cars, as follows: A material box car, a tool box car, a material flat car, a foreman's office and bunk car, a water car (which also carries the coal and a motor car), a bunk car and one diner (which is used for a paint car at the present time).

The foreman does not operate the machines in the power tool car, although he is qualified to do so. One man in the gang, with the power equipment, can rip more lumber than ten men with hand tools. A similar ratio is true for other work. The one operator can keep ten men busy in general repair work and the work is completed in much less time. A gage of the operator's ability to turn out work with the power car is indicated by the fact that he can make five six-light window sash with 12-in. by 14-in. window panes in eight hours. His output on straight ripping, planing and sanding is, of course, much greater.

So far the Frisco has used these

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cars almost entirely for emergency repair work. With a stock of unfinished lumber, the outfit moves into a town and without delay the men go to work, doing everything that needs to be done in the way of repair to buildings and structures (excluding bridge work). Such work includes revamping and repairing depots, repairing coal chutes, repairing wooden water tanks and many small jobs of all types. The cars have also been used on some new building work, including the construction of new passenger stations at Newburg, and Neosho, Mo., and Camp Maxie, Okla., the construction of a locker room at Francis, Okla., improvement work on the 7th Street Station at St. Louis, Mo., and revamping an old hide tanning house at Joplin, Mo., to convert it to a garage and storehouse.

The cars cost approximately \$2,870 each. This includes \$1,318 for machines and tools, \$52 for store expense and \$1,500 for labor and materials, including the repair of the car, wiring and constructing the machine bases, work bench, cupboards, etc. The first two cars that were built have been in service a little more than two years, and it is estimated that they have saved much more than their cost in that short period of time.

The idea of equipping such cars was conceived originally by the general officers of the Frisco, working with various officers and employees of the maintenance of way department, and assisted by the mechanical department of the road.

Work Equipment "Saving the Day"

(Continued from page 248)

With some of the units of equipment being employed, the advantages over hand methods are so large as to defy accurate comparison. For example, no maintenance officer would attempt to estimate accurately the man-hours that have been saved annually by the more than 52,000 motor cars on the railways, or the added manpower that would be required to execute by hand methods the extensive ditching and drainage programs that have been carried out by the railways in recent years with the aid of tractors, bulldozers, angle dozers, carryall scrapers, blade graders and Jordan ditchers and spreaders; nor would he attempt to guess the savings in man-hours that have been effected by the extensive employment of weed-mowers and burners.

The plain fact is that, without the

aid of this equipment, the extensive programs of essential ditching, cut widening, bank stabilization and weed destruction carried out by the railways in recent years—all in the interest of a sounder, more stable and more easily maintained track structure—would have been absolutely impossible. At the same time, if these programs had not been carried out, it is a certainty that the man-hours required for practically every other class of track maintenance would have been increased far out of proportion, or the condition of the track would have deteriorated materially.

Space limitations will not permit discussion here of the extent to which the railways have overcome the shortage of maintenance labor during the last two years through the more extensive use of their other types of track maintenance tools, their snow and other material-handling equipment, and the power units employed by their bridge and building forces, but no one questions that all of this equipment has played a vital part. All in all, it is estimated that without their power equipment, the railways would have required at least 70,000 additional full-time maintenance of way and structures employees in 1943, the employment of which, under the conditions that existed, would have been utterly impossible.

Only when one adds to this picture the large savings in many materials that have been made possible through the use of much of its equipment, and the prolonged life of other materials, to mention only the extended life of rail, switch points, frogs and crossings by welding, can he begin to appreciate fully the invaluable part that work equipment has played and will continue to play in the wartime maintenance of the tracks and structures of the railways.

Few maintenance officers have failed to see this picture clearly. This is evidenced in the already large-scale mechanization of their forces; it is evidenced in the extensive and skillful use that is being made of this equipment on most roads under the wartime difficulties of peak traffic and an inadequate labor supply; it is evident too in the careful attention that is being given on most roads to the field and shop maintenance of all of their equipment, to avoid unnecessary wear or breakdowns in the field; and it is evidenced by the fact that the railways plan to continue to add further to their present equipment as fast as efficiency, economy, labor shortages or increased work programs demand—their contemplated purchases of such equipment in 1944 including approximately 10,000 units, at a cost of about \$14,000,000 is further evidence.



Railways Need Will They

Materials and Production Capacity Are Still Tight, But Both the WPB and the Manufacturers See Improved Conditions Ahead

War Production Board Is Optimistic

INQUIRIES made of the War Production Board at Washington have elicited the encouraging information that the year 1944 will see a definite and substantial improvement in the factors governing the ability of the railroads to obtain their requirements for maintenance of way work equipment. In fact, present indications are said to be that, in regard to many types of machines, the railroads will be able to obtain practically their full requirements of such equipment in the remaining months of the year.

Reasons for Improvement

This improvement is attributable to a number of factors. Important among these is the fact that the Controlled Materials Plan, which was placed in effect in 1943 for allocating the most critical materials, has brought about a more careful and equitable distribution of the available supplies. In addition, for various reasons, such as cut-backs in military requirements, the supplies of certain critical items have become more plentiful, and this situation is naturally reflected in a more liberal attitude on the part of the agencies responsible

for allocating them to the various users. Finally, there are indications of a growing appreciation of the need for helping the railroads to solve the critical manpower problem in maintenance of way work by authorizing more liberal purchases of equipment.

The outlook appears to be particularly good for those types of equipment that are designed and built especially for use in railway maintenance of way work;—that is, equipment of the type that is manufactured under authorizations issued directly by the Transportation Equipment division of the War Production Board. Present indications are that it will be possible this year to permit the manufacturers to obtain practically all the raw materials and component parts, such as engines and bearings, that they will need to fill railroad orders for equipment of this type. This means, in other words, that the present outlook for materials is such as to warrant the belief that it will be possible to authorize the railroads to purchase nearly all of the equipment of this type which they need.

Although showing considerable improvement, the situation is somewhat different with respect to those types

of machines, such as air compressors, electric generators and cranes, that are manufactured for general industrial use but are employed widely in maintenance of way work. Requests from railroads for authority to purchase such equipment, while subject to the purview of the Transportation Equipment division, which appends its recommendations, are passed on directly by other divisions of the WPB. Since some items in this category are still in great demand by the armed forces, the indications are that the supply will not be sufficient completely to satisfy the demand from all sources. Also, there are certain bottlenecks, such as the inability of some manufacturers to fill their requirements for engines, that are having an adverse effect on the supply of certain items of equipment in this category. However, the situation has shown considerable betterment and may be expected to improve still further as time goes by.

Helpful Suggestions

Broadly speaking, it is apparent that the system under which work equipment purchases are requested and authorized is functioning smoothly, and that a high degree of understanding of their mutual problems has been established between the railroads on the one hand and the WPB on the other. In presenting applications for authority to purchase work equipment to the WPB, it is necessary that the railroads cite convincing reasons of their need for such equipment. In WPB quarters it is suggested that, to receive the greatest consideration, the presentation should be specific as to the need for the equipment and the manner in which it is to be used to solve the road's wartime maintenance problems. The suggestion has also been made that the railroads can best assure themselves of obtaining their equipment needs by taking advantage of alternate sources of supply.

The improvement that has taken place in the supply of certain critical

More Work Equipment in 1944—

Be Able to Secure It?

materials has had still another beneficial effect on the work equipment situation in that it has permitted some manufacturers to do away with or reduce the use of substitute materials in their products. Among the so-called critical materials, the situation regarding aluminum has shown the

greatest improvement, a development that will be welcomed by manufacturers and users of machines in which aluminum is employed to save weight. There has also been a betterment in the supply of alloy steels, but the situation regarding copper has shown little or no improvement.

supplied answers to a similar group of questions.

Before considering the relationship of the manufacturers to the general equipment picture, what are the needs of the railways for work equipment in 1944? Faced with what promise to be their largest programs in history in an attempt to keep their tracks and structures in condition to withstand the heavy demands that are being made on them by the continuing record-breaking war traffic, maintenance of way and structures forces desire to purchase more than 10,000 units of power tools and work equipment in 1944, involving an estimated expenditure of about \$14,000,000, as set forth in a preceding article in this issue. This all-time record in their anticipated needs compares with their purchase of 8,500 units in 1943 at a cost of approximately \$12,300,000, a previous record, and an earlier peak of 8,000 units purchased in 1941 at a total cost of approximately \$10,500,000.

Manufacturers Will Do Their Part

AS indicated in the foregoing statement, the War Production Board is optimistic concerning the ability of the railways to obtain their essential requirements for maintenance of way and structures work equipment in 1944. But how about the manufacturers of this equipment? Will they be able to make deliveries? Has their situation improved over that of a year ago, and what are the prospects in the year that is now opening?

The answers to all of these questions are highly pertinent to the main question—will the railways be able to secure the work equipment that they need in 1944? This is true because they involve factors that lie beyond the scope of the War Production Board in its control of materials and priorities, including plant capacity, backlog of orders, labor shortages, and other factors peculiar to the manufacturers themselves.

To secure answers to these questions, inquiry was made of a number of representative manufacturers, and the answers received, combined with the foregoing information elicited from the WPB, should go a long way toward giving railway maintenance officers as clear a view as it is possible to obtain of the over-all work equipment picture in the months immediately ahead. Uniformly, the replies received from manufacturers, tempered only by a continuing desire on their part to do their full share in meeting the demands that are being

made upon them by the armed forces. Lend-Lease and other war agencies, showed a keen understanding of the railways' problems and a highly solicitous attitude toward their needs. Furthermore, with but a few exceptions, all of the manufacturers were much more optimistic as to their ability to meet the needs of the railways than they were 12 months ago, when they

More Steel Production Will Be Turned To Essential Civilian Needs as the Requirements of the Army, Navy and Lend-Lease Decrease



With the reasons for these larger equipment needs in 1944 discussed at length in the earlier article in this issue, it is sufficient to point out here that they include the unprecedented wear and tear of traffic on the fixed properties, calling for larger programs of maintenance; shortages in certain essential materials, such as rail and crossties, demanding larger expenditures of labor on existing facilities to prolong their life; and the prevailing shortage of labor—critical in many areas—which has impaired seriously the ability of the maintenance forces to carry out their enlarged programs with the labor and equipment available.

The fact that the maintenance forces do not have all of the work equipment that they will require in the year ahead is due first, to the enlarged programs in prospect; second, to the excessive wear and tear on their equipment during the last two years, in spite of intensive efforts to maintain it; and third, to the fact that most of them, due to restrictions, were unable to secure all of the equipment they needed in the last two years. In this latter regard, it is important to recall also the determination of the maintenance forces during the last two years to get along with less equipment than they would have purchased under more favorable conditions. Convinced today, however, that nothing can be allowed to stand in the way of meeting their essential requirements for additional equipment if the railways are to continue to meet the essential demands of war transportation safely and expeditiously, the maintenance forces plan to press for their larger needs in 1944. One road alone is seeking about two and one-half times as much equipment as it sought or was able to secure in 1943. Will the manufacturers be able to meet these demands?

Manufacturers Carrying Heavy Load

From the standpoint of the manufacturers themselves, there are at least five factors that must be considered in answering this question: (1) The size of the demands of the Army, the Navy, the Maritime commission, Lend-Lease and many vital war industries; (2) the availability of the necessary materials; (3) plant capacity; (4) the availability of adequate labor; and (5) the size and character of the demands of the railways themselves.

It is too well known to require discussion that the Army, the Navy, Lend-Lease, the Maritime commission and many war industries have first call on both essential construction materials and upon the production

capacity of all industries, including that of the railway supply manufacturers—that the needs of all of these agencies command higher priority ratings than the needs of the railways, which are still denied a war industry status in spite of their indispensability to the success of the war effort. It is also well known that some manufacturers upon whom the railways have relied for certain classes of equipment in the past have become virtual ordnance plants for the Army, Navy and Lend-Lease, and that to fill these demands, these plants have expanded their production capacity through extensions to their plants, re-tooling and more intensive operations.

In spite of all that has been done in this regard, the ability of manufacturers to keep abreast of orders has changed but little during the last year. Some railway supply manufacturers are still booked to capacity for more than a year ahead. Others are several months behind on production. Few, if any, are in a position to make immediate deliveries on current orders, regardless of priority ratings. Of 24 companies answering a question as to their principal difficulties preventing prompt deliveries to the railways, 11 named as first the demands of the Army, Navy and Lend-Lease, although it is significant that several manufacturers who were supplying the bulk of their production to these agencies 12 months ago, now find Lend-Lease, rather than the Army or the Navy, taking the major part—with little relief for the railways and other so-called essential civilian industries.

Material Situation Better

Practically all of the manufacturers questioned state that inadequate quantities of materials, or delays in receiving such materials as are allotted to them, are affecting their deliveries adversely to some extent, although most of them indicate considerable improvement in this regard over the situation which prevailed a year ago, and a few rate materials as among the least of their concerns. This is not surprising in view of the generally satisfactory operation of the Controlled Materials Plan during the last year, which has cut down vast inventories built up earlier by many industries, as well as the Army and the Navy, to protect their interests: which has assured all of the interested parties, including the railways, of a fairer share of the available critical materials: and, withal, which has simplified the procedure of each in obtaining that to which it is entitled.

Some manufacturers who are experiencing little difficulty in securing

materials for the equipment or parts that they manufacture themselves, have been having their greatest difficulties in securing auxiliary equipment from other manufacturers—especially electric motors and generators, certain types of gasoline engines and ball and roller bearings. These manufacturers have been helpless to better their situation in this regard without higher priority ratings for their railway orders.

Significantly, only 9 of the 24 companies making replies stated that labor shortages in their plants, either existing or developing, are a controlling factor in their production. A few also mentioned WPB limitation orders as affecting their ability to produce or sell specific items of their products to the railways, although all of those mentioning this factor saw little relief for the needs of the railways until these orders are lifted or modified substantially.

Have Not Forgotten Railway Needs

One thing stands out pre-eminently in all of the answers received from the manufacturers, and that is that they have not forgotten the needs of the railways. With a keen appreciation of the importance of the railways to the war effort, and of their specific maintenance problems, it is evident that most of these companies feel a sense of responsibility to the railways and have reserved some of their capacity to meet their needs.

Evidence of this attitude is contained unmistakably in answers to a question as to whether these companies are still actively soliciting further railway business. To this question, 23 of the 26 companies making reply said "Yes"—that they are not only soliciting railway business, but are in a position to accept orders and to make reasonably prompt deliveries. Only three companies stated that other pressing demands upon their plant capacity will not permit them to solicit further railway orders at this time, and one of these indicated that while it did not feel warranted in soliciting additional business, it was not turning down unsolicited orders.

Throughout the railway supply industry, including even those companies which are booked to capacity with orders for months ahead, it is evident that manufacturers are attempting, to the extent of their ability, to keep alive their railway contacts, both to aid the railways in the most effective use and maintenance of their equipment already on hand, and to assure them of their fullest co-operation in making deliveries of their essential additional requirements at the earliest possible date.

Nothing that has been said in the foregoing implies necessarily that any of the manufacturers questioned can fill orders today without some delay. Still taxed to capacity in many cases, subject to delays in deliveries to themselves of essential materials and auxiliary equipment, not to mention WPB limitation and restricting orders, shortages of skilled labor, etc., only a few manufacturers today can make prompt deliveries of other than the simplest tools or equipment if they require critical materials. A few of them still have equipment on hand for immediate delivery with suitable priority rating, but most of them, already burdened with prior orders, can accept and fill additional railway orders only with delivery dates extended from two to four or five times normal, even if the orders are accompanied by high priorities. However, it is significant that many of these manufacturers indicate an improvement in their delivery situation as compared with that of 12 months ago.

Manufacturers Recommendations

In the light of this situation, railway supply manufacturers make several specific recommendations in the interest of still further improving deliveries. Pre-eminent among these is that the railways anticipate their requirements far in advance of their actual needs and place their orders at the earliest possible date. Under a system in which orders with equal priority ratings are filled in the order of their receipt, this appears fundamental. Furthermore, knowing the demands to be made on them for specific units, the manufacturers can better program their production schedules and can better stock the materials called for, both of which are in the interest of more prompt deliveries to the railways.

Second among the recommendations of manufacturers to the railways in their need for equipment is that all orders be accompanied by the highest possible priority ratings. Without such ratings, they point out that they cannot secure the necessary materials to fill orders or cannot proceed with the building of the equipment from materials on hand, so long as they have Army, Navy or Lend-Lease orders with the highest priorities.

In still another recommendation, the manufacturers suggest that the railways can help themselves in securing their needed equipment by accepting standard models, eliminating special requirements as to materials and feature of design, and, if necessary, permitting the substitution of comparable machines. Some manufactur-

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ers point out that their production is restricted to certain types and designs by specific limitation orders. Some indicate self-imposed restrictions on refinements in or deviations from generally accepted standards, in order to prevent congestion in production and a disproportionate use of labor. One manufacturer, whose equipment has been barred from the railways by limitation orders, urges that the railways, individually, and through the Office of Defense Transportation, attempt to secure relief from these orders, and another stresses the importance of naming the specific date when it is essential that the equipment be on hand. This latter manufacturer states that "in some cases last year, we were pressed for delivery and then found that our machines were not put into service for a month to six weeks after they were received. If we had known this, we could have changed our production schedule, and, without disadvantage to the roads concerned, could have made shipment to other roads which really required the equipment at the earliest possible date."

While not stressed in the replies received from any of the manufacturers this year, it appears essential that in the equipment that they must have, the railways continue to accept adequate substitutes for critical items of materials. Apparently, initial resistance to substitute in some railway quarters, which was indicated by the manufacturers a year ago, has almost entirely disappeared, the railways recognizing that adequate substitutes must be accepted where shortages or limitation orders make it impossible to continue the production of former standard parts. Rather than resist the inevitable in this regard, it is incumbent upon railway maintenance officers to co-operate with manufacturers to the greatest extent, to the end that such substitutes as are essential, shall be developed to the highest degree of efficiency and serviceability for railroad use.

Prospects for 1944 Deliveries

Will conditions improve? Will the railways be able to secure their enlarged needs for power tools and work equipment this year? The War Production Board, with a back-stage view of the material situation unequalled by any other agency, indicates that, from the standpoint of materials, and except for certain specific types of machines or machine accessories, they will be able to secure practically all of the units for which they can show urgent need. At the same time, the manufacturers are more optimistic of their ability to fill

orders with improved delivery dates than at any time during the last 12 months.

Asked whether they anticipate any improvement in their production and delivery situations in the months immediately ahead, 19 manufacturers of a total of 23 answering this question, stated that they expect present conditions to improve, some qualifying this only to indicate improvement after the middle of the year, or just as soon as conditions with respect to electric motors, gas engines and bearings improve. Only three manufacturers look for little or no improvement in conditions during the next nine months, and only one indicates that, due to specific conditions in its field, its deliveries to the railway field might become still worse.

Some of the tightest situations as regards equipment still obtain with respect to locomotive cranes, crawler-type tractors and heavy grading equipment. One manufacturer points out that while government requests for locomotive cranes for domestic use are now fairly well supplied, the demands for Lend-Lease and various other overseas operations are increasing. In the case of crawler tractors, the situation is best understood when it is realized that only 15 per cent of the output, which is the part that has been assigned for civilian uses, must be divided up to satisfy the needs of lumbering, mining, petroleum production, agriculture and other basic industries, as well as the railways. Likewise, in the case of heavy grading equipment, the major problem is still the heavy demands of government agencies, which continue to take practically the entire output of many plants. With such conditions prevailing, it is obvious that in all of these various types of equipment, the strongest representations on the part of the railways are necessary if units are to be made available to them.

In support of the belief by most of the manufacturers questioned that deliveries of equipment to the railways will be increased and speeded up during 1944, there are certain favorable indications. Of primary importance in this regard is the fact that while the production of practically all critical materials, including steel, aluminum and rubber, continue at their war-time peaks, the domestic construction needs of both the army and the navy have been largely satisfied, and the ordnance needs of both branches of the service are tapering off as huge stores are accumulated in almost all categories. In fact, sizeable cut-backs in earlier forecasted military demands have already resulted in the allocation of more liberal

quantities of steel to essential civilian industries, including the railways, and there has likewise been a substantial easing up of the situation as regards aluminum and the supply of certain alloy steels.

As regards aluminum, it is interesting to note that as early as last December, the track motor car manufacturers were advised by the WPB that they would be allowed some aluminum for essential production in 1944, and, presumably, this advice was sent to other manufacturers of power tools and machines who have found this metal so well adapted, if not essential, to the highest development of their products. While more aluminum has not been forthcoming to railway equipment manufacturers to date, at least one motor car manufacturer has already announced that, with a keen desire to get back to its complete aluminum design, it will take full advantage of all aluminum that is made available to it to bring about a step-by-step conversion from present substitutes, utilizing this material first where its use will be the most effective in improving the utility and performance of its cars.

No one anticipates full relief from any of the present restrictions on critical materials until the war is brought to a successful conclusion in both Europe and Asia, although there is ample justification for the expectation that the defeat of Germany will bring much relief in materials all along the line.

Added to these considerations, there has been a constantly growing appreciation, both in Washington and outside, of the remarkable job that the railways are doing in sustaining the war effort of the country, and of the importance of making available to them the materials that are essential to a continuation of that kind of a job. This, combined with the smooth working of the Controlled Materials Plan, the position of the Office of Defense Transportation as the claimant agency of the railways before the War Production Board and a more understanding and sympathetic attitude on the part of the WPB itself than ever before, augurs well that the essential needs of the railways will not be overlooked.

In the light of all of these considerations, and the assured co-operation of the manufacturers to the extent of their ability, it seems certain that, with few exceptions, the railways will be able to secure their enlarged essential needs for work equipment in 1944. However, with many materials still insufficient to fill all demands, and with insufficient productive capacity in industry to keep abreast of all orders, it is still essential

that the railways follow carefully the procedure that has been set up to secure suitable priorities or other authority for purchases; that they establish the essentiality of their needs beyond question; that they anticipate their requirements and place their orders far in advance of actual needs; and that they co-operate with manufacturers to the fullest extent in accepting standard models and substitute parts where, to do otherwise would complicate production and slow down deliveries all along the line.

N. Y. C. Mechanizes Its B. & B. Forces

(Continued from page 250)

the portable electric tools are available at most of the division carpenter shops, and for the use of any other bridge and building forces, such as tinsmiths, roofers, plumbers, and other mechanical forces that may have need for them.

How Gangs Are Equipped

As a matter of interest and as an indication of the extent of mechanization on this System, it may be well to review briefly the types of power tools and equipment that are in general use by the various types of bridge and building gangs, other than as already described in some detail. Each steel-bridge repair gang, for instance, is equipped with a complete complement of pneumatic tools, such as rivet hammers and busters, chipping and scaling tools, air motors for grinders, brushes, drills and reamers, rock drills for drilling anchor bolt holes, and impact and other types of wrenches, as well as an oxy-acetylene cutting outfit. Available for use by the masonry gangs are concrete mixers, pneumatic paving breakers and rock drills, and a number of cement guns. Spray-painting is used widely on this road, especially in bridge work, and many of the paint gangs are equipped with spray-painting outfits as well as pneumatic chipping, scaling and brushing tools. Welding repairs to structures are handled by gangs especially trained and equipped for such work.

Motor cars, of course, are standard units of equipment for the bridge and building gangs, although during the last decade or so there has been a trend toward the use of motor trucks for transporting men and materials, especially in terminal areas. Twenty-five-ton and fifty-ton locomotive cranes comprise other standard pieces of equipment, and, in addition, the rail-laying cranes used by the track department are available for use by

the bridge forces. For driving piles, steam pile hammers are used and the leads are generally hung from the booms of the locomotive cranes. Portable centrifugal pumps in a range of sizes are available for use as needed, as well as a number of sand-blasting outfits for use in bridge-cleaning work. Miscellaneous types of equipment available for use by mechanics include power pipe-threading machines, power shears and machines for bending metal shapes.

The portable air compressors used by the bridge and building forces are generally of the 105-cu. ft. (eight-tool) size and are skid mounted, although a number of trailer-type compressors are in use, particularly in terminal areas, where they have special advantages because of their maneuverability. Ordinarily, each of the steel-bridge repair gangs has a compressor that is regularly assigned to it, but the other types of bridge and building gangs are assigned compressors only when performing work that requires the use of compressed air. It frequently happens that compressors are borrowed from the track department for this purpose.

Although only a few of them have been acquired to date, there is still another unit of power equipment that is worthy of mention. This is a portable gasoline-engine driven flexible shaft outfit, comprising a concrete vibrator, a float for finishing concrete surfaces, a hand-held saw, a dapping machine and a centrifugal pump.

A Special Adaptation

In addition to the types of equipment mentioned in the foregoing, it frequently happens that the bridge and building forces are able to make special adaptations of less commonly used machines with highly satisfactory results. As an illustration, in connection with the construction on one division of two timber trestles of considerable length, the injection of a preservative material into the bolt holes bored in the piles for fastening the sway bracing, which was being done with hand tools, was proving to be a laborious operation. To reduce the labor involved, the idea was conceived of adapting to this operation a power-driven lubricating machine of the type that is common at automobile service stations. Accordingly, a unit of this type was provided and, when equipped with the necessary fittings for this special task, it was adapted to the work with highly effective and economical results.

From the foregoing, it is apparent that the policy of the New York Central System, is to make available to its bridge and building forces all the advantages inherent in a high degree of mechanization.

What Will the Postwar Needs Be?



This Discussion of the Probable Requirements for Maintenance Work Equipment Following the Close of Hostilities Discloses Many Uses for Which Power Machines and Tools Will be Demanded

By I. H. Schram

Chief Engineer Maintenance of Way, Erie, Cleveland, Ohio

IN many respects the conditions now confronting the maintenance of way departments of the railroads resemble those that confronted them during the first World War 25 years ago, but in many others the conditions are strikingly different, and the needs after this trying period will probably be governed more by these differences than by the similarities. In the earlier period, there was also a serious labor shortage which could be overcome only by the use of mechanical devices, and attempts were made by most of the railroads to procure such equipment. At that time, however, only a limited number of types were available, and the equipment that could be purchased was practically all on-track which, when power driven, depended on steam. As a result, in the war years and in the first few years thereafter, such machines as were purchased were of that type, and large purchases were made of steam-driven on-track locomotive cranes, ditchers, pile drivers, steam pile hammers, hoisting equipment and similar types, as well as spreaders and air-operated rail loaders which obtained their

power from the work-train locomotive. There were also some early and crude types of ballast-cleaning machines.

Motor cars had been in use a relatively short time on most of the railroads, and their designs were primitive, compared with those of today. The first pneumatic tie tampers were being introduced but the compressors were not yet developed to an economical design. Crawler-mounted equipment was unknown, and most of the modern small gasoline-driven devices were yet to be invented. Much of this early equipment is still with us and still working, despite its age, its obsolescence and the expense of working and maintaining it. For these reasons, one of the major problems of the post-war period will be the substitution of modern machines of more efficient designs to replace these obsolescent units.

Probably greater advances have been made in earth-moving machinery than in any other type of equipment, and much economy will be effected in carrying out the post-war grading that must of necessity be done. All of us expect that new demands will be made for speed and safety in moving traffic when normal conditions return, which demands will require stronger road-

beds and better drainage. Cuts will be widened and embankments will be strengthened; yet the money available for the work will doubtless be limited. Off-track shovels, or combination shovels and drag lines, will replace steam-driven on-track units, eliminating work trains and the expensive delays that they entail. These machines will probably be powered by the new light-weight Diesel engines that present research is developing, and the smaller crews that will be required will add another element of economy.

Power-hauled carryalls will be used with them where conditions permit, replacing the air-dump car and the work train. Bulldozers are much in the public mind and there will be great need for them, particularly as they generally provide the cheapest means of moving earth within their operating limits. Owing to the difficulty of obtaining replacements at this time and the hard usage that existing units are undergoing in the intensive work of helping to provide facilities for war work and for moving war traffic, this machine will probably be in the forefront of future requirements.

It will be noted that the maintenance requirements for earth-moving machinery have been given major consideration and these will doubtless

form the principal portion of post-war requirements. The extent of the construction requirements for such equipment in the same period, above normal amounts in the possession of contractors and others, is still doubtful, and is based on many such considerations as traffic, available funds and perhaps the tax situation. Undoubtedly, however, programs of line revision, curve reduction and yard construction of considerable magnitude will be carried out and will make necessary further replacements of obsolete and wornout units. However, these replacements may be affected by units in workable condition released from wartime construction. Certainly some units, such as trucks, will require extensive replacements.

The condition of our ballast is becoming one of our most serious problems as the war continues. Ballast is fouling at an unprecedented rate under war-time traffic, and labor for its replacement is scarce and inefficient. No one factor contributes more to smooth-riding and safe track than clean ballast, and where stone, slag or other hard ballast has been applied it must be cleaned, particularly where the track has been brought to an elevation fixed by concrete and steel bridges, paved crossings, permanent station platforms and the clearance limits of electrification fixtures. Much equipment has been developed for the work, some off-track and some on-track. In many places, the latter cannot now be used because of traffic conditions and this restriction may remain, to some degree at least, in the future when increased speed of traffic is considered.

Perhaps one is not looking ahead too far if he expects the development of an off-track machine that will clean ballast under and between ties, eliminating separate cribbing of track and leaving it in shape for power tampers. However, the machines that are in use, including moles and cribbing machines, have not been available in sufficient numbers to cope with the present situation, and some railroads that have been contemplating their use have had to postpone all or part of their proposed purchases. Such deferred requirements will probably be met when the present restrictions on the use of critical materials are relaxed further. This will constitute a back-log, to which replacements can be added.

Tampers Will Be Needed

Tamping machines have developed in several directions from the early models. Originally conceived as relief for the sorely pressed section forces during the last war, the first development was toward large units, with

pipe lines feeding compressed air to 8, 12, 16 or 20 tools, which were used in out-of-face surfacing. This was in line with the trend at that time towards specialized gangs organized to take over heavy maintenance operations. Electrically-driven tools were also developed in this period. Later the need for smaller units asserted itself and resulted in the design of small light compressors for spot tamping and surfacing at turnouts, station platforms, crossings and similar locations. Many of these outfits have been purchased in recent years, as the heavy traffic and lack of experienced manpower indicated the growing need for such equipment.

Tie tampers of other than pneumatic operation have also been developed, and unit tampers are being produced, so that we now have a choice ranging from one tool to large-gang outfits. Most of these are new and will have long future life, but the older and larger units have also been redesigned and improved and the economy and efficiency of the new units and low-air-consumption tools point to a general replacement of the obsolescent and worn-out machines of the old types when conditions again become normal. Off-track equipment of improved design, already mentioned, will be given more and more consideration as obsolescence is considered and present requirements of the armed forces disappear. The obvious economy of such machines, particularly in the larger units, will add to the desirability of such equipment.

Organizations for laying rail are again being given attention, as is usually the case when heavy traffic makes it imperative that the occupancy of main tracks be reduced to the minimum. This can best be accomplished by mechanization of the several operations, and this trend undoubtedly will continue, particularly as some of the machines needed cannot be obtained in the desired numbers at this time.

Motor Cars Pay Best

Motors cars are probably our oldest and one of our best-paying labor savers. They accounted for many of the savings during depression days, when lengthened sections were introduced, and in the same way are now helping us overcome our manpower shortages. However, many of those in service are old and are not standing up any too well under the severe service in which they are working on the longer sections. Here again, new models embodying modern features of reduced weight and better-designed engines, are available and, when light weight alloys are again obtainable, the

demand for these models will increase. Long sections will probably stay with us after the war, and motor cars designed for such service will be in increased demand.

For some time, the use of motor trucks for transporting men and materials has increased because of high-traffic-density problems, but this may not continue when traffic decreases with the close of the war, and the motor car may then be restored in part to its former position. This will increase the demand for the new and better models. Probably, at the same time, many of the highway trucks now being used will be worn out and require renewal, and where they can be used to advantage they will be replaced. Certainly, they have earned a definite place in maintenance of way work, particularly in terminal areas.

Need for More Power Tools

One of the major developments in recent years has been the introduction of small portable power tools and machines for section gangs and carpenter and bridge forces. Power-operated bolt tighteners, grinders, rail drills, rail saws, tie-boring machines, mowing machines and weed burners are examples of machines which have enabled reduced forces to maintain tracks safely. New uses are being developed continually for them, while they are also used temporarily in such heavier operations as laying rail, applying lag screws and heavy welding operations.

Similarly, bridge and building gangs have been equipped with power saws of various types, drills, concrete breakers, improved concrete mixers, paint-spraying machines, paint-cleaning brushes and various other tools. The demand for them is increasing, and the extension of their use can be expected. Carpenter, bridge, plumbing and signal gangs have probably been given less than their just quota of mechanical devices in these difficult times, and much more can be done for these forces when their needs are studied more fully and suitable equipment is developed. Certainly many such devices are now on the market or in use and can show desirable savings.

It is our usual experience that the demonstration of a real need brings forth the desired equipment and that the supplier can usually fill our wants when the specifications are outlined clearly. The same co-operation undoubtedly will continue, and new devices will be added when the research now being conducted for our armed forces is applied to peacetime pursuits, among which railroading will continue to hold a leading position.

\$13,000,000 for Work Equipment in 1944

(Continued from page 233)

such tools as rivet busters, riveting hammers, chipping hammers, rotary brushes, impact and other power wrenches, steel drills, wood borers, circular and chain saws, air, electric and chain hoists and others, aggregating more than 20 types.

More Portable Tools

However, basing the estimate partly on the information received, and partly on the volume of purchases that have been made in previous years, compared with the number budgeted at the beginning of these years, it is concluded that approximately 1,000 of these portable units will be ordered during the year. This conclusion is strengthened by the fact that the budgets include 136 air compressors, 45 generators and 9 power units, a total of 190, which are in addition to those included in the tie-tamping, welding and paint spraying outfits incorporated in the budgets, this being the largest number of power plants ever to be budgeted.

Another variety of equipment, of which more than the usual number of units will be purchased, is that designed for fighting snow. With the acute shortage of labor that is confronting maintenance officers, and the prospect that the situation will be worse by next winter than at present, the railways are planning to buy 52 snow-fighting units, including plows for clearing main tracks, truck-mounted plows, tractor-mounted sweepers and snow loaders.

Widening Use

One of the most striking facts connected with work equipment from its inception has been the continued expansion of its use, except during the depression, and the rapidity of its acceptance during the last six or seven years. Today, executive officers no longer need to be convinced of the advantages of power machines and tools. They recognize not only their inherent value, but their absolute necessity in a time of dire need for labor. Like those who are most directly concerned in the maintenance of tracks and structures, they are aware that in a wider use of power machines and tools lies the only solution of the problems that confront them.

Yet, another and equally striking fact arises in this connection, which cannot be ignored, for it has been strongly in evidence for the last six or seven years. This is that, despite

Railway Engineering and Maintenance

the heavy purchases of power machines and power tools during each of these years, a real shortage of work equipment still exists on almost every road today. While this information can be adduced from several sources, the fact that, year by year, almost every budget has contained provision for additional units, and this is more pronounced this year than in any previous year, is undeniable evidence that such a shortage exists.

In previous years, this expanding use of work equipment has been explained by the inexorable pressure for greater economy in all phases of railway operation. Today, while economy is as desirable as ever and is not being overlooked, is of secondary importance.

If any skepticism with respect to the advantages of mechanization has remained, it has broken down in the face of these demands and of sheer inability to meet them without recourse to power machines and tools. This is indicated quite clearly by the fact that the discussions which accompanied the details of the budgets, as they were given to us this year, contained no evidence of self satisfaction with respect to the equipment already in service, or of any tendency to believe that this equipment is ample to meet all needs, a feature that was quite noticeable with respect to some roads two or three years ago.

On the contrary, more than one officer expressed real concern over the possibility that allocations of materials and priorities with respect to their distribution might prevent them from obtaining the equipment they need so badly. It took many years of evolution in the thinking of both maintenance and managing officers, climaxed by a critical shortage of labor, to bring them to the stage where the outlook is so nearly universally favorable to a wider use of work equipment. Having arrived at this viewpoint, there is no reason to believe that it will be discarded lightly.

One of the serious obstacles to obtaining maximum value from work equipment has been the inability on the part of many officers to understand the inherent effects of obsolescence and the economic loss that can be sustained by reason of it. There is an understandable reason for this, since, with an inadequate number of power machines, there has been a strong tendency to hang on to the older and outmoded units since, if they were in safe condition for operation, some saving could always be effected by substituting them for manual operations, although by comparison with later models they might be the reverse of economical.

During the last three or four years, however, there has been much greater

appreciation of obsolescence for, along with the many additions that have been made to the work equipment already in use, many of the units that have been purchased have been for the replacement of these older units, particularly those that survived the period of the depression. It does not matter that those older units were not always retired because they were obsolete, but rather because they were so nearly worn out that the expense of maintaining them had become unreasonably high, for the net result has been the same as if they had been retired because of obsolescence. Today the percentage of equipment that is modern is higher than it has been for many years, despite the tendency to keep the older units in service until the labor crisis has been passed.

Meeting War Conditions

Ten years ago, at the depth of the depression, the maintenance forces were reduced severely as a result of falling revenues. Before conditions permitted any marked increase in these forces, the movement to shorten train schedules had its inception and this created a demand for higher standards of maintenance that have increased consistently until today. At that time maintenance officers learned that only through the intensive use of the work equipment they then possessed was it possible for them to maintain their tracks to the standard that was then required. Today new and higher standards of maintenance are necessary to provide for higher speeds for all trains and a traffic of unparalleled density.

At present, the conditions imposed by the war are less favorable than those of ten years ago. While overall speeds are about the same as they were then, far more high-speed trains are being run and traffic is moving in record volume. In spite of this fact, the labor available is well under that was employed during the earlier period, and much of it is of decidedly lower efficiency. Yet the tracks and structures must be maintained to these higher standards or there can be no assurance that important war traffic will move safely and expeditiously.

The important question is, what can be done about it? It must be repeated that the only escape from the dilemma created by insistent demands for better maintenance on the one hand and smaller resources of labor with which to meet them on the other hand, is to make the most intensive use of the work equipment now in possession of the railways and to purchase the maximum number of units that can be obtained under the restrictions that are imposed by the war. Any other course will invite disaster.



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To the Readers of
Railway Engineering and Maintenance

As announced previously and detailed in these columns, the American Railway Engineering Association will resume its annual meetings on March 14-16, at the Palmer House, Chicago, and it is a pleasure for me to have this opportunity to invite you to attend.

Since our last annual meeting in 1942, world-shaking events have piled huge added national responsibilities upon the railways. You, as engineering and maintenance officers, have shared in these responsibilities and have been confronted with many new and difficult problems. Through these years, the A.R.E.A., which is dedicated to the advancement of knowledge pertaining to the scientific location, construction, operation and maintenance of the fixed properties of the railways, has endeavored to be of the greatest possible help to you in the solution of these problems—and our work, in which many of you have had a large part, goes on. In fact, we now have a bigger job to do than ever before.

That we intend to carry on is indicated anew in the plans that have been made for our coming annual meeting. The program for the meeting will include the usual presentation of committee reports, but will be highlighted throughout by special features and addresses giving consideration to the specific problems arising out of the war, and to the future problems with which you men will be faced incident to postwar adjustments and developments.

More than ever before, the meeting this year should be of interest and benefit to you and the railways you represent. It is designed to aid you in meeting the critical problems of labor and materials during the session that will soon open. I hope, therefore, that you will consider this a personal invitation to attend the meeting if you can possibly do so, and that you will be present especially at those sessions at which the subjects most closely related to your work will be considered.

Yours sincerely,

H. R. Clarke, President

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A.R.E.A. Keys

To Acute

President invites
Readers to attend
annual three-day
session in Chi-
cago, Mar. 14-16.
Sees added impor-
tance to get-to-
gether this year



H. R. Clarke
President

WITH a keen sense of their responsibility to the outstanding contribution that the railways are making to the war effort, engineering and maintenance officers of the railways of the United States and Canada will meet in Chicago on March 14-16, under the auspices of the American Railway Engineering Association, to consider the many difficult problems that confront them, especially in the light of shortages in both labor and materials, and to look ahead to post-war readjustments and developments. The meeting, which comes after a lapse of one year—no annual meeting having been held in March 1943—will be held in the Grand Ballroom of the Palmer House.

Keynoting the meeting, J. M. Symes, vice president, Pennsylvania, will address the opening session on

The Task Before Us. This will be followed at the annual association luncheon on Wednesday by an address by R. L. Groover, associate director, ways and structures, ODT, and by a special session on Wednesday evening, which will be addressed by Lt. Col. Sherer, chief maintenance of way officer, Headquarters staff, European theater, Military Railway Service, on The Contribution of Railways Men to the War Effort in the Combat Zones.

Two other outstanding features of the meeting will be symposiums on the two most critical problems confronting engineering and maintenance officers—Labor and Materials. The former, which will be presented on Tuesday afternoon, will include addresses on The Over-All Picture, by H. L. Carter, director, Bureau of

Employment and Claims, Railroad Retirement Board; on The Employment of Mexican Nationals, by T. E. Blair, assistant chief engineer, A.T. & S.F., system; and on The Employment of High School Boys, by W. G. Powrie, engineer maintenance of way, C.M. St. P. & P.

The symposium on Materials, which will be the feature of the Wednesday afternoon session, will be opened by Albert C. Mann, director, Transportation Equipment division, War Production Board, who will discuss the Over-All Picture, and will include addresses by A. A. Miller, chief engineer maintenance of way and structures, Missouri Pacific, who will discuss Track Materials; by

Annual Meeting

War-time Problems



A. R. Wilson, engineer bridges and buildings, Pennsylvania, who will discuss Bridge Materials; by A. L. Sparks, architect, Missouri-Kansas-Texas Lines, who will discuss Building Materials, and by A. B. Pierce, engineer of water supply, Southern, who will discuss Water Service Materials. Still another high-light of the program will be a third symposium at the Thursday-morning session dealing

with The Postwar Problems of the Railways. The special features of this symposium will be addresses by Ralph Budd, president of the Burlington Lines, on Problems and Opportunities for the Railways, and C. E. Smith, vice president, N.Y. N.H. & H., who will speak on The Challenge of Postwar to Engineering and Maintenance Officers.

Interspersed through the program,

23 special and standing committees of the association will present reports on 113 subjects covering a wide range of problems confronting track, bridge, building and water service officers.

The meeting will be presided over by H. R. Clarke, president of the association and chief engineer of the Burlington Lines, assisted by Vice-President F. R. Layng, chief engineer, Bessemer & Lake Erie.

Program

Tuesday, March 14

MORNING SESSION—9:45 A.M.

Meeting called to order
Address by H. R. Clarke, president
Reports of the Secretary and the Treasurer
Address on the Task Before Us, by J. M. Symes, vice-president, Western region, Pennsylvania
Reports of committees on
Signals
Electricity
Economics of Railway Location
Yards and Terminals

AFTERNOON SESSION—2:00 P.M.

Labor—Our Number 1 Problem
Report of Committee on Economics of Railway Labor
Address on The Over-All Picture, by H. L. Carter, director, Bureau of Employment and Claims, Railroad Retirement Board
Symposium on Expedients That Have Been Tried—Mexican Nationals—T. A. Blair, assistant chief engineer, A. T. & S. F. system
High School Boys—W. G. Powrie, engineer maintenance of way, C. M. St. P. & P.
Discussion
Report of Committee on Maintenance of Way Work Equipment

Wednesday, March 15

MORNING SESSION—9:00 A.M.

Reports of committees on
Highways
Roadway and Ballast
Track
Rail

ANNUAL LUNCHEON, 12:00 O'CLOCK

Address by R. L. Groover, associate director, ways and structures, Office of Defense Transportation—representing Joseph B. Eastman, director.

AFTERNOON SESSION—2:15 P.M.

Materials—The Number 2 Problem
Address on The Over-All Picture, by Albert C. Mann, director, Transportation Equipment Division, War Production Board

Symposium on Measures to Meet Existing Shortages in Materials

Track Materials, by A. A. Miller, chief engineer maintenance of way and structures, Missouri Pacific
Bridge Materials, by A. R. Wilson, engineer bridges and buildings, Pennsylvania
Building Materials, by A. L. Sparks, architect, Missouri-Kansas-Texas Lines
Water Service Materials, by A. B. Pierce, engineer of water supply, Southern

Discussion
Reports of committees on
Buildings
Water Service

DINNER—4:00 P.M.

Dinner tendered by National Railway Appliances Association.

EVENING SESSION—8:00 P.M.

Address on The Contribution of Railway Men to the War Effort in the Combat Zones, by Lt. Col. Ralph E. Sherer, chief maintenance of way officer, Headquarters Staff, European Theater, Military Railway Service

Thursday, March 16

MORNING SESSION—9:00 A.M.

Reports of committees on
Ties
Wood Preservation

The Railways Look Post War

Report of Committee on Co-operative Relations with Universities

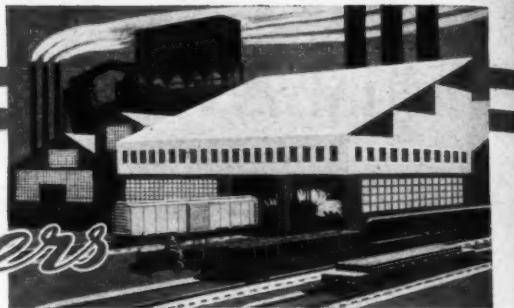
Address on Problems and Opportunities for the Railways, by Ralph Budd, president, Burlington Lines
Address on The Challenge to Engineering and Maintenance Officers, by C. E. Smith, vice-president, N. Y. N. H. & H.

Reports of committees on
Iron and Steel Structures
Wood Bridges and Trestles
Clearances
Impact

AFTERNOON SESSION—2:00 P.M.

Reports of committees on
Records and Accounts
Masonry
Waterproofing
Closing Business

PRODUCTS of Manufacturers



New Model of Buda Sectionmaster

A NUMBER of improvements have been made in a new model of the Buda Sectionmaster, two- to eight-man section motor car, which is now designated as the G-1, Model B. Chief among these improvements are a new two-speed transmission, which enables the car to pull three or four trailer loads of ties; new spring-mounted pedestal wheel bearings on all four wheels; a new skid rail across

car, with ample seating and tool tray space, and with power enough to haul capacity crews and also tow up to 4000 lb. on trailer cars.

New Chain Saw Is Recent Mall Tool Product

THE Mall Tool Company, Chicago, has begun the manufacture of a new type gasoline-engine driven chain saw which offers several advantages in heavy-duty sawing, including an



The New Mall Gasoline-Engine Driven Chain Saw

the front of the car, to enable one man to remove it easily from the track at any angle; and a new sleeve-type differential axle.

The new Sectionmaster is 90 in. long, 63½ in. wide, 42 in. high, has a wheel base of 37 in., and weighs 1150 lb. with the two-speed transmission. It has extension lift handles and a rear lift of 110 lb. The frame is of welded steel, gusseted and well

engine which will run in any position, an automatic clutch, a safety guard to provide protection and a new type of cutting chain of special heat-treated saw steel which acts as a solid band saw when in the wood.

The engine is of the two-cycle, two-cylinder type, developing four horsepower. It has aluminum alloy pistons, cylinders of die cast aluminum with special alloy sleeves, forged bronze



The Model B Sectionmaster Incorporates a Number of New Improvements

braced, and the car has safety rails of steel tubing, front and rear. The car is powered with a Briggs & Stratton, Model ZZP, one-cylinder, four-cycle, air cooled engine.

The new Sectionmaster is said to be a rugged, dependable light section

connecting rods, an airplane-type carburetor, large-capacity air filter and fuel filters, flywheel fan cooling, rope starter, and an automatic centrifugal-type clutch. Lubrication of the saw chain is controlled by the engine exhaust and the chain tension is adjusted

by the turning of a special socket head screw on the clutch housing.

It is said that the automatic clutch permits the engine to continue operating even though the saw is forced too hard or is pinched. This saw is made in two models of 24-in. and 36-in. capacities, respectively.

New Simplex Hydraulic Jacks Meet Industrial Need

AS a means of meeting demand for a unit which will move heavier weights with the speed required by wartime tempo, Templeton, Kenly &



The New Simplex Model 30HJ, a 30-Ton Hydraulic Jack

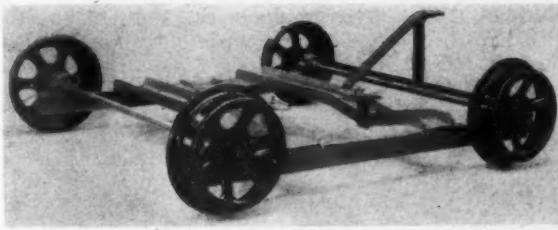
Co., Chicago, has added new tandem-pump Simplex 30-ton and 50-ton hydraulic jacks to its line of lifting devices, which are adaptable to bridge work, journal work or any work where direct lifting is required. The new jacks have high and low speed pumps which can be operated singly or in unison, and are said to be dependable and easy to operate. Special-analysis solid steel bar stock forms the base of the jack to add to the load-bearing security. For the convenience of the operator, the

jacks are equipped with two release valves located on opposite sides of the base, either of which controls the ram return. An easy-carrying grip is also an integral part of the high-speed pump. Dimensions of the Model 30HJ (30-ton unit) are: low height, 11-in.; hydraulic lift, 7-in.; weight, 65-lb. Dimensions of the Model 50HJ (50-ton unit) are: low height, 12-in.; hydraulic lift, 7-in.; weight, 115-lb.

New Schramm Fordair Compressor-Generator

SCHRAMM, Inc., Westchester, Pa., has developed a new Fordair compressor, Model No. 60, with a 5 kw. single-phase generator, which is de-

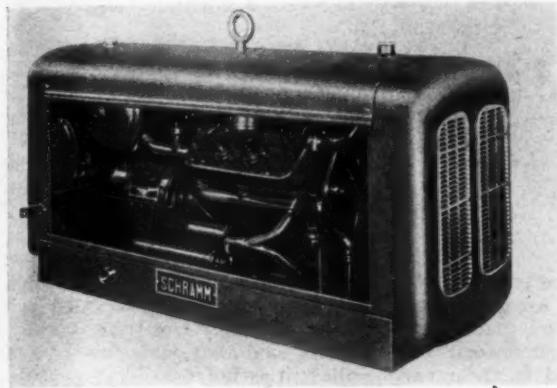
The New Trailer for Hauling Off-Track, Portable Compressor Units



steel frame with conventional axles and 14-in. demountable wheels. It has two channels extending transversely across the trailer between the main frame members. These are bent downward to form a shallow V at the point where the compressor wheels rest when loaded on the trailer and a locking device is provided for each compressor wheel. Ease of loading and unloading is

& Co., Chicago. The new motor car is an adaption of the company's No. 44-B standard section car and is designed for use where greater seating capacity is required. The No. 59 has a capacity of 2000 lb., is 47½-in. high, 106½-in. long and weighs 1240 lb. The rear lift is 378 lb. It has the same engine as the 44-B, with a water-cooled cylinder and air-cooled head, Timken crankshaft bearings, a clutch and chain drive, battery ignition and a five-gal. capacity gas tank.

Other recent developments in Fairbanks-Morse Motor car equipment include the manufacture of the new A. R. E. A. 16-in. and 20-in. bolted demountable plate wheels, new steel pulleys for belt drive motor cars, and a new and improved differential axle.



The New Schramm Model 60 Fordair Compressor-Generator

signed as a compact source of compressed air and electric current for location under a work bench in a portable machine shop or on a truck, trailer or railway car. The unit will produce 60 cu. ft. of compressed air at 100 lb. gage pressure; or 5 kw. of single-phase alternating current at 120 volts; or simultaneously compressed air and electric current to the extent of the engine horsepower. The Schramm Safety Vacuum Control limits the supply of air compressed when an electric load is being carried.

said to be a special feature of the new trailer and is simplified by a detachable ramp which permits the compressor unit to be wheeled onto the low, underslung trailer and then be clamped firmly into position.

F-M Section Motor Car with Long Body

FEATURED by an extra long body which is capable of seating 12 men, a new section motor car, listed as No. 59, is being built by Fairbanks, Morse

Frog and Switch Planer

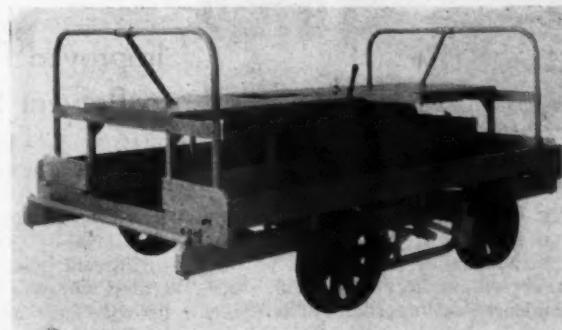
THE Cincinnati Planer Company, Cincinnati, Ohio, has developed an improved frog and switch planer for railway frog and switch shops, which is designed primarily for high production and the greatest possible rigidity in withstanding the heaviest cuts in frog and switch planing work. The planer has a double-length enclosed bed with an extra deep housing cheek bearing to the bed. A full-depth box-section arch adds to the rigidity of the housings. A wider V spread to the bed and table is provided. The table is of substantial depth and is provided with full-length hold-down gibs.

The combination herringbone balanced drive is said to run efficiently and smoothly under the heaviest cuts and is built for 100-hp. operation.

Fairmont Trailer for Compressor Units

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has recently designed and constructed a special type of strong but light trailer for safe and easy hauling of off-track portable, non-self propelled compressor units. Models are available for various types of compressor units, including Ingersoll Rand models 55 and 60, and a Syntron unit. The trailer consists of an underslung

The New F-M. No. 59 Section Motor Car Has An Extra Long Body



All shafts are of large diameter with hardened, ground and lapped journals. Gears are of hardened steel, and heavy-walled bronze bushings are used throughout the drive train. The Hypro tool block abutment is said to relieve strain on the clapper box pin. A self-locking worm is used to swivel the clapper box.

The rail and down-feed screws are of extra large diameter. A long bronze nut is mounted near the top of the slide where it is accessible for easy replacement. The double-bronze saddle nuts have a provision for taking up backlash. Counterbalanced inverted dovetail slides are

the tool into the work for tapering and trimming as the table moves in the cut direction. Both heads may be moved manually in either the same or opposite directions simultaneously, using a single crank. An instantaneous rail lift is optional.

New Use for Q & C Gaging Tool

ONE of the larger railroads has enlarged the use of Q & C gaging tool by employing it as a pre-gaging tool back of the rail laying crane, which it reports as "greatly facilitating the



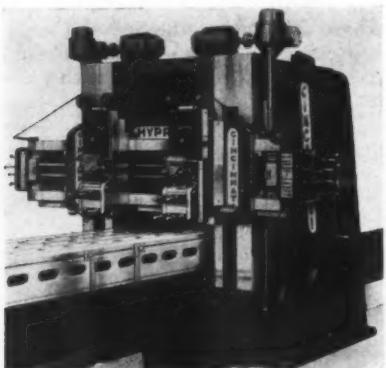
Showing the Gaging Tool in Position on the Rails

said to prevent the dropping of the slide and the consequent hammering of the screw in the nut as the tool strikes the cut.

The rail heads are mounted on a square-gibbed narrow guide cross rail. A sealed feed and traverse unit with hardened gears and clutches, and with all shafts mounted in anti-friction bearings running in a bath of oil, is said to contribute exceptional convenience and flexibility to

work of the rail-gaging crews." Thus road reports that this use of this tool has been made standard practice for rail-laying gangs on that system. The tool is usually applied at about two points on each rail near the quarter points, between the rail ends and the center.

The Q & C gaging tool is operated by one man and consists essentially of a hickory cross-piece with a pronged metal casting at one end which bears on the fixed rail and a pivoted rail-throwing head at the opposite end, equipped with a pipe handle, for moving the rail outward or inward. The rail-throwing head is provided with two notches on each side for movement of the rail within a distance of 2 in. and within a distance of 4½ in. The tool is adapted for use with any weight of rail, is compact, and weighs only 31 lb.

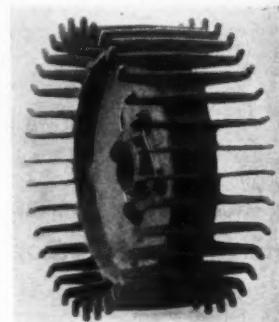


The New Frog and Switch Planer

the directional controlled traverse and feed.

Heads and slides can be fed and traversed in any direction, independently or together. There is a special jogging device for feeding

blades, a rim and a center disc formed from sheet steel and jig-welded for accuracy. The raised ends on the blades keep the belt in



The Improved Fairmont Blade Type Axle Pulley Is Designed to Prevent Slippage in Deep Snow and Heavy Weeds

position on the pulley, like the flanges on the standard pulley. The hub is of malleable iron, fastened to the center disc with four cap screws. It is keyed to the axle, as is the standard pulley, and has a positive clamp and set screw for holding the pulley in position on the axle. The center disc opening and the seat on the hub are turned to close tolerances to provide an exact fit and make the pulley run true.

It is said that with this type of pulley, it is not possible for weeds, snow or ice to become lodged between the belt and drive pulley and thus cause the belt of the car to slip.

New 200-Amp. Lincoln Welder

THE Lincoln Electric Company, Cleveland, Ohio, is introducing its Model SA-200, 200-amp., engine-driven welder, which includes in its design and construction a number of features particularly adaptable to railway track welding. The welder is unusually compact and is constructed in one unit, with base and canopy integral. It is equipped with a new type of job selector which varies the open circuit voltage of the unit by varying the speed of the engine, resulting in lower operating costs and longer life.

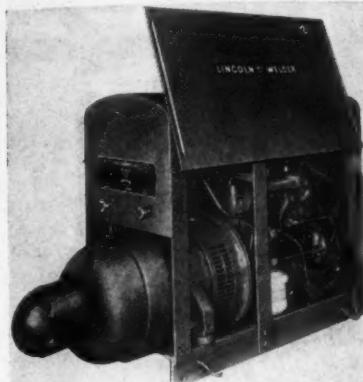
The welder is powered with a water-cooled 4-cylinder Continental engine developing 29 h.p. at 1400 r.p.m. The engine specifications include cast iron cylinders, drop-forged crankshaft, drop-forged "I" beam section for connecting rod assembly, replaceable thin-shell steel-back cadmium-nickel-lined main bearings and alloy steel forged crankshaft and

Improved Pulley to Prevent Slippage

THE blade type of axle pulley for motor cars built by Fairmont Railway Motors, Inc., Fairmont, Minn., has been changed in construction. This type of axle pulley is designed to prevent belt slippage on cars operated where deep snow or tall weed growths are prevalent. The new blade-type axle pulley now has

cams with solid bronze bushings. Lubrication is performed by a helical gear-type pressure oil pump.

A 16-gal. gasoline tank of welded, pressed steel construction is mounted over the generator with a gravity feed to the carburetor. A high-tension magneto, governor and air cleaner are other features of the engine. Di-



The Model SA-200 Lincoln Welder Is Unusually Compact and Has a New Type Job Selector

mensions are: overall length, exclusive of crank (removable) $65\frac{1}{4}$ in., width, 24 in., and height, $41\frac{1}{2}$ in.

The engine and generator unit are mounted on rubber feet to cushion them and provide smooth operation. The unit frame may be mounted on a two-wheel pneumatic or steel-tired trailer chassis.

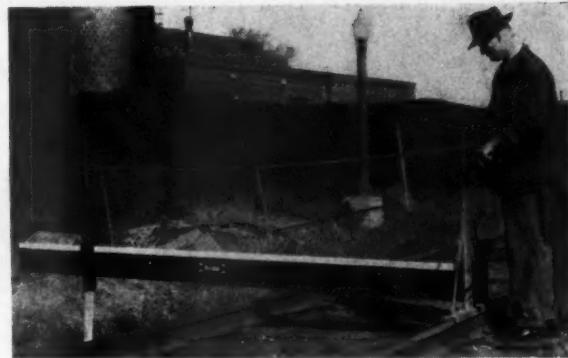
New Design For Stanley Heavy-Duty Drills

THE Stanley Electric Tool division of the Stanley Works, New Britain, Conn., is introducing a new design for its line of heavy-duty drills, including the Nos. 342 and 781A, of $\frac{3}{4}$ -in. and 1-in. capacity, respectively. In this new design the universal motors are housed in streamlined aluminum alloy housings and the drills are equipped with full anti-friction bearing motor shaft and gears. In addition, the handle is extra long, of sturdy construction and contains a fully-enclosed automatic release switch which differs from that of older drill models in that it operates from the pressure of the operator's hand.

The No. 342 is furnished with a standard three-jaw chuck and can be equipped with a No. 2 external Morse taper socket on special order. It also includes a flat on the chuck spindle drill on which a wrench may be used to remove the three-jaw Jacobs chuck. The No. 781A is furnished with a No. 3 external Morse

Railway Engineering and Maintenance

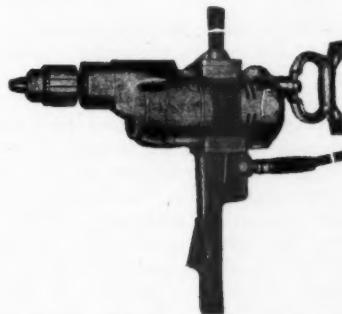
The Fairmont High-Speed Spot Board Can Be Quickly Adjusted and Is Designed to Prevent Tipping



taper socket. Other models in the line, which are equipped with the new type handle, are the Nos. 122 and 582, heavy-duty $\frac{1}{2}$ -in. and $\frac{5}{8}$ -in. drills, respectively.

These drills can be equipped with a pipe handle base and an auxiliary pipe handle, which can be removed

be pivoted about the grade stake to allow trains, motor cars or push cars to pass, and immediately thereafter can be set back on the rail without readjustment. Graduated blocks and sighting blocks are furnished with the board, and with the graduated blocks, it can be used without grade stakes for making a uniform raise.



The Improved No. 342 Heavy-Duty Drill

for close quarter work. All Stanley drills have an Eastman cable protector with a locking device.

High-Speed Spot Board

FAIRMONT Railway Motors, Inc., Fairmont, Minn., is now producing a High-Speed spot board for surfacing work, similar to the conventional type used for many years, but with improved features which permit greater speed and accuracy of operation. The board has a sliding cuff on one end, with a cupped bottom which is set on the top of the grade stake. This insures that the board will stay on the stake. The other end, which sets on the rail, is well braced to prevent tipping and has a hand screw for rapid and accurate leveling of the board. A level bubble is mounted in the top edge of the board near the adjustable end, where it is clearly visible to the operator.

The board is designed to stay in adjustment regardless of vibration, wind, or other disturbances. It can

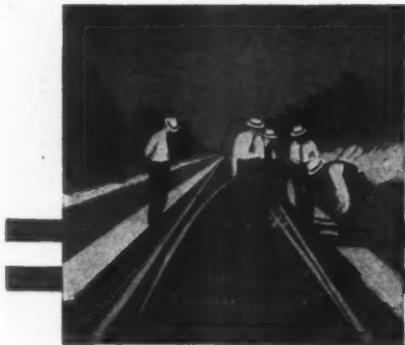
New Hand-Held Rock Drill

LISTED as the Model L-47, a new 45-lb. hand-held rock drill has been produced by the Sullivan Machinery Company, Michigan City, Ind., which is said to have the drilling speed and power of a 55-lb. drill and holding qualities comparable to a 35-lb. drill. In construction and design, it is similar to the Sullivan Model L-57 and embodies the following features: A dual-valve construction which gives complete control of admission and cut-off of air to either end of the piston independently, a wide open exhaust directed away from the operator, a



The New L-47 Rock Drill Has Features Which Are Said to Assure High Efficiency and Operator Comfort

large oil reservoir, a rubber-cushioned one-piece steel retainer, a shake-proof throttle valve handle, and direct-to-steel airblast for hole cleaning.



What's the ANSWER?

How Much Supervision?

To what extent and in what ways should additional supervision be provided to compensate for the quality of labor now available? For what classes of work?

Needs Careful Analysis

By F. R. LAYNG

Chief Engineer, Bessemer & Lake Erie,
Greenville, Pa.

During the present emergency, the most careful use must be made of such labor as is available. Furthermore, owing to the shortage of materials, it is essential that both labor and material be used only on necessary work. It is our observation that many operations that have been desirable heretofore can be postponed, and that there has not yet been a concerted effort to forego these operations that are not absolutely essential.

To accomplish this, it is necessary that both foremen and subordinate officers ask themselves whether any work they are about to undertake is necessary. Foremen should be given to understand that such work as is undertaken shall not be patchwork, but must be done carefully, in the best manner possible with the labor and material available. After the work is done, the supervisor or assistant supervisor should examine it to see that it has been done to best advantage.

In addition to the inspection of such work as is undertaken, it is more than ever essential that all facilities that affect the movement of traffic be inspected frequently, to anticipate the probability of breakdowns and take steps in advance to prevent failure. In the past, it has been customary to assign to subordinate officers investigation of matters that do not relate to maintenance of facilities that affect the safe movement of traffic, such as complaints relating to drainage, or to grade crossings, sometimes

involving conferences with public officials; and others requiring conferences with industries.

So far as possible, those directly in charge of track and other facilities that have to do with the safe movement of traffic should now be relieved of investigations that can be made by others, to the end that they will have more time to supervise and inspect essential facilities that are in their charge. Those who are directly over such subordinate officers doubtless can relieve them of much unnecessary paper work and insist on their giving as much time as possible to supervision and inspection.

Consideration should be given to adding assistant supervisors to the staff during the present emergency. A careful analysis should be made to determine whether the present staff is adequate to do what ought to be done. Never before have supervision and inspection assumed the importance they bear at present.

Now Ample

By P. O. FERRIS

Chief Engineer, Delaware & Hudson,
Albany, N. Y.

At present both track and bridge and building gangs are small by reason of losses that cannot be replaced. Since we are unable to replace men

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in May

1. To what extent is it desirable to equip section gangs with spot tampers? Why? How many? Will they increase the output of the gang? If so, how much?

2. What methods should be followed when dismantling buildings to insure maximum recovery of materials? How can the recovered materials be used to advantage?

3. What advantages, if any, are there in installing rail and flange lubricators on hump tracks in classification yards? What disadvantages? Should they be installed ahead of or behind the initial car retarders?

4. Considering the density and character of present traffic, should measures be taken now to brace and stiffen pile trestles, that would not be required ordinarily? Why? What measures? How should the bracing be applied? Does the height of the trestle or character of the stream make any difference?

5. Should the ends of rails be beveled at the time the rail is laid? Why? If not, how soon thereafter?

6. In what ways can the consumption of sheet packing be reduced?

7. When ballasting, should the ties be tamped throughout their length? Why? When making a lift without ballast? If not, between what limits should the tamping be done? Does the kind of ballast or the height of the lift make any difference?

8. In what ways can labor and material be conserved in the maintenance of interior wall surfaces? What are the advantages? What precautions are desirable?

who have left us for various reasons, I believe that in both number and ability our supervisory forces are organized to handle these depleted gangs, and a still larger force if the

men can be obtained. This applies to our ordinary established gangs.

Only a few foremen and assistant foremen have been lost, by our road, because they are generally beyond the draft age; their wages are higher in comparison with the regular forces; and they have been long in the service and have thereby gained considerable seniority. Because of this standing, they have not been attracted by the higher wages in war industries.

It is apparent, therefore, that by reason of the retention of our foremen and assistant foremen generally, and of the depletion of the gangs, they are able to devote more time to inexperienced men who may be hired in an effort to augment our regular forces. Again, because many of our older trackmen and bridge and building employees have also acquired considerable seniority, we have been able to retain many of them and, by scattering these men among the new men whom we are able to hire, these inexperienced men whom we must take at this time, are being supervised.

One of the most serious aspects of hiring inexperienced men is that of safety. While I believe that our present supervisory forces are more than ample to supervise the work, considerable extra supervision is necessary from a safety standpoint. This applies particularly, and with extra emphasis, in cases of emergency, such as wrecks, washouts and snow when it is necessary to scatter the men to keep switchers clear. When it becomes necessary to scatter the men, we try to distribute the older men among the groups of inexperienced men to guide them so that they will prosecute the work with safety.

In extra gangs that are hired for seasonal work, or in extra gangs that are augmented for seasonal work, supervision is provided by assigning more assistant foremen to the gangs than would ordinarily be required for gangs of experienced men. To summarize, therefore, we have ample supervision to compensate for the quality and quantity of labor that is now available for both track work and bridge and building work.

Can Do With More

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Owing to the large number of inexperienced men whom we must now employ if we are to maintain a sufficient force to do even the most necessary work, it is obvious that more supervision is needed than was required when only a negligible part of

Railway Engineering and Maintenance

our forces lacked experience, and when those who did were generally distributed in small numbers through gangs containing men who had been with us continuously, many of them for long periods.

More supervision is needed in many gangs to teach inexperienced men to do workmanlike jobs, as well as to make certain that they learn how to work safely. It is all right to say that the foreman must be more alert and exercise greater care in handling his gang—he should. On the other hand, he has many things

to demand his attention and often there are times when he cannot oversee all of the many details that should be watched, particularly in a gang composed largely of inexperienced men. This is a matter, however, that should be studied for each gang individually, and where a need is indicated we should not hesitate to appoint an assistant foreman.

Likewise, aside from any question of inexperienced workers, more overall supervision is needed when there is so large a turnover in the forces as there is today.

Can Women Do Building Work?

To what extent is it feasible to employ women in building work? In bridge work? For what tasks? Is preliminary training necessary? How should this be given?

Is not Feasible

By A. E. PERLMAN

Chief Engineer, Denver & Rio Grande Western, Denver, Colo.

I do not consider it feasible to employ women in either building or bridge work. While some building work in and around terminals is within their physical capacity, to segregate that work so as to make it available to the women, will hinder rather than help in the final output.

So far as bridge work is concerned, I do not believe that any of it is within women's physical strength. Even if the work could be engineered so that women could do it, there would still be the problem of housing the women away from their homes. It is my settled belief that the best use is made of woman-power when women are placed on jobs that they can handle with the minimum of disturbance to practices already in effect, and bridge and building work is not of this type.

Can Do Some Tasks

By G. S. CRITES

Division Engineer, Baltimore & Ohio, Baltimore, Md.

Bridge and building programs authorized for the current year can be used as the basis from which the number of man-hours of work that must be done can be calculated. These man-hours can be segregated into hours of work that women might do and hours of work for which they are clearly unfitted. Cleaning and painting buildings, mopping and pitching

flat roofs, repairing and conditioning floors, shop work involving the use of light machine tools, electric and gas welding, truck driving and other similar tasks that involve less than ordinary strength in back and wrists, should be analyzed to determine whether they can be done by women.

It may be that, in highly industrialized sections, women capable of doing building work can find employment that is more favorable than any they can get in the maintenance of way department. However, rural communities can often supply women capable of doing these jobs, and it might be well to canvass the families of maintenance-of-way employees.

Many railways are working women in track gangs successfully. When so employed, they do their best with foremen who explain what is expected of them and why they are doing the work. Under sympathetic guidance they do well, up to their physical capacity. Women from farms, from rural communities and from foreign lands will be found in such gangs, who have done almost man's work from maturity.

Except in rare instances where there is a supply of likely women to draw from for bridge and building work, women track gangs can be used to test the capabilities and aptness of recruits for bridge and building work. Among them there are likely to be some who clean and paint the interiors of their own homes, who drive tractors and trucks or who do other work that is related or similar to essential bridge and building work.

For obvious reasons, a poorly selected and untrained group of women under unsympathetic supervision, cannot be expected to do satis-

factory work on any assignment. During inclement weather, which may prevail for some time, when women may not be able to work outside to advantage, those that seem most likely may be tried at interior cleaning and painting. Some will be found who can be trained to do outside building painting and even bridge painting.

Those who are particularly apt should be advanced to helpers for work in camps and shops and trained to keep them clean, and also to keep

materials and tools in order. If sufficient aptitude is shown, they can be trained as welders or machine-tool operators.

Women workers should be segregated from men partly because of basic inequalities which cannot be overcome, but they should not be coddled or favored. The right and able kind are as desirous as anyone to do their part toward winning the war. If they know that their efforts count, they ask no favors.

prevent wetting the hose by leakage of the valve. Dragging hose of any kind, especially over rough ground or in grit, is another damaging agent to be avoided as much as possible.

Conserving Fire Hose

What measures should be taken to prevent deterioration and thus conserve the life of fire hose? Who should be responsible?

Must Keep Dry

By J. H. DAVIDSON

Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

Two types of hose are used for fire service—rubber-lined cotton hose and unlined linen hose. Each requires special maintenance methods to prevent rapid deterioration. In some places, a single-ply rubber-lined cotton hose is suitable if ordinary water pressures are encountered. This hose has the advantage of being lighter and, therefore, more easily handled than the heavier jacketed hose, while it can be dried more quickly, and the cost is less. For yards and in buildings where pressures are higher and where the hose is subjected to rough handling, a heavier rubber-lined cotton hose with additional plies is recommended.

To prolong the life of rubber-lined cotton hose, certain precautions are necessary. After each use the hose should be dried thoroughly by hanging in a drying tower or by spreading out on drying racks. If it is put on a hose cart and allowed to remain while wet, the hose will become damaged quickly. If a drying tower is not available, a slanting ventilated hose rack can be used effectively. This rack should be 52 ft. long, 4 or more ft. wide, 1 ft. above the floor at the lower end and at least 3 ft. high at the upper end, and with a slatted top. It may be built in sections to facilitate moving.

Hose should not be left exposed to sunlight or heat after it has dried thoroughly and, if dirty, it should be cleaned by brushing after drying. Oil is injurious to rubber-lined hose, and for this reason graphite lubrication is recommended for the metal fittings to prevent danger of oil damaging the

fabric. It is recommended that water be run through the hose at least four times a year, to keep the rubber in good condition.

Avoid storing rubber-lined hose in a warm place, as heat deteriorates rubber. A small ventilated hose house is preferred. If the hose is folded onto a hose truck instead of a hose cart, it should be removed from the cart at frequent intervals and replaced, so that the bends and kinks will come at different places, to prevent the cracking which will develop if the hose is always bent at the same spot. Sharp bends and kinks should be avoided as much as possible.

Unlined linen hose is suitable for hanging up in exceptionally dry warm rooms of office buildings and those of similar occupancy, and is recommended for this purpose. Its chief value is for short lines for brief use inside buildings and is best because of its lightness, compactness and convenience for use by one man. It should not be overlooked that linen hose is damaged every time it is wet, but if it is kept in a dry place and is dried out carefully and thoroughly after each use, it will give many years service.

This hose should never be wet, except to use it at a fire, and when it is attached to a pipe line, the valves should be tight so as not to wet the hose by leakage. This is the most common cause of damage to hose of this kind. Racks for linen hose should allow the hose to hang vertically, as this gives better ventilation than if the folds are laid horizontally. The hose should be stretched out from time to time, to insure that it is dry between layers.

Where either rubber-lined or linen hose is attached to hydrants in buildings, it is advisable to place a small drip cock in the body of the valve to

Life Normally Short

By C. R. KNOWLES

Superintendent of Water Service (Retired)
Illinois Central, Chicago

At its best, fire hose has a relatively short life. The manufacturer's guarantee usually covers a period of only three to five years. Yet, experience has shown that good cotton rubber-lined fire hose will last from 10 to 15 years under favorable conditions. Fire hose is designed for one purpose only, that of fighting fire, and its use for any other purpose should be prohibited.

However, it is not uncommon to find it being used in a variety of ways that are detrimental from several points of view. It is a more or less common practice to use fire hose for washing down freight-house floors and platforms, for washing cars, for wetting down yards and driveways, for filling locomotive tenders, for flushing sewers and for other forms of service. Using a fire hose for general purposes is not only poor practice of itself; it will not only shorten its life but may render it unfit for use when badly needed to fight a fire.

Fire hose is not designed or intended for uses of this character, and the practice will damage the hose and, in many cases, the couplings and threads. Cases may be cited where these uses have reduced its life more than half. A damaged hose may fail when most needed to fight a fire, or if it is in use for other purposes, when a fire breaks out, there may be sufficient delay in getting into action to allow the fire to get out of hand. It is evident, therefore, that aside from any loss that may occur by reason of shortened life for the hose, the fire hazard will be greatly increased. Where hose is being used for any of the purposes mentioned, inquiry will disclose lack of supervision, lax discipline or indifference on the part of some supervisory officer. These things do not occur otherwise.

It is good practice to run water through cotton rubber-lined hose about four times a year, as this tends to keep the rubber in good condition. However, the cotton cover should be kept dry at all times. The hose should be tested under fire pressure once each year. After use, it should be drained and the cotton fabric should be dried thoroughly before it is returned to the reel. Moisture on stored hose will

damage the fabric quickly. If the hose is dirty, it should be cleaned with a brush or a broom after it is dried.

Unlined linen hose is used for fire-protection purposes inside buildings, and it must be kept dry. It is injured every time it becomes wet. Sharp kinks in fire hose should be avoided, as they damage both rubber and fabric. Under no circumstances should hose be used for handling hot water or oil, as either will destroy the rubber lining or render linen hose unfit for further service.

Both inspection and testing of fire hose are usually the responsibility of

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the water service forces, while care of the hose is the responsibility of the local forces, that is of agents, shop foremen, master mechanics, and others who may be in charge of the operations or facilities which the fire hose is intended to protect. Where a fire department is maintained at a shop or a terminal, the local fire chief generally is made responsible for care of the hose. The present scarcity of rubber and the importance of fire protection make it doubly desirable that every effort be made to conserve fire hose through better care and avoidance of improper use.

product cannot be obtained, they can be made by the concrete forces of the railway, if care is used in their design and manufacture.

Certain precautions should always be observed when installing or replacing a crossing. The drainage should be adequate, the ballast clean and of suitable depth and the track should be tamped solidly. Nothing, except a derailment, will destroy a crossing quicker than poor drainage and poor support for the ties, besides which the track will not ride smoothly.

Names Several Substitutes

By G. M. O'Rourke
Assistant Engineer Maintenance of Way,
Illinois Central, Chicago

Where slag and some kinds of stone ballast are in use, a fairly satisfactory street or road crossing may be maintained by filling the track to the top of the rail with the ballast. If any of the planks are reclaimable, they can be used on the inside of the traffic rail to provide a flangeway. A good substitute can be made by mixing chads with oil from waste reclamation plants at mechanical-department shops. Another possible substitute is second-hand crossties turned upside down and fastened to the track ties by means of long boat spikes or bolts.

Reinforced concrete slabs make excellent street and highway crossing material, provided the reinforcing can be obtained. The use of scrap rail or of scrap plates on old planks is not permitted for the duration. Several excellent types of asphaltic compounds and paving mixtures are on the market, which can be purchased without priority. I know of no other substitutes, and can only suggest that by turning the planks over it is often possible to obtain considerable additional service from them.

Substitutes for Wood Crossings

In view of the shortage of lumber, are there any substitutes that can be used to repair plank crossings? If not, what expedients can be adopted to maintain such crossings satisfactorily for the duration?

Conserve Carefully

By W. H. SPARKS
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Despite reduced highway travel imposed by restrictions on the manufacture and sale of motor vehicles for civilian use, and on the purchase of gasoline, the condition of street and highway crossings at grade is of no less importance than it was when highway travel was unrestricted. There are many types of crossings in service, some of which cannot now be replaced in kind because the materials are not available; material for some others can be obtained only with difficulty; and the replacement of still others can be devised by the maintenance forces with materials that are still available to them.

Types of crossings in service include wood plank, which may be either creosoted or untreated, metal, concrete, bituminous materials and rails, although many of the latter have disappeared in the recent scrap drives. Crossing planks can be conserved and considerable additional life obtained from them by turning them over when the exposed surface has become worn. When replacing a wood crossing, usually some of the plank removed will be fit for further service, and these should be saved for use in patching other crossings that need repair.

Again, I have noted that some roads use crossing planks for making motorcar setoffs. If these planks are in good condition, they should be removed and used to replace worn or

damaged planks in crossings. They can be replaced in the set-offs with second-hand bridge ties or other timbers released from structures, which are not suitable for re-use under load.

Bituminous materials are not under priority, and they can be used to advantage as substitutes for the wood plank crossing or, for that matter, for any other type of crossing that needs replacement. It is true that they are not always easy to get, but if one anticipates his needs far enough in advance, this will not be a handicap, particularly as the same difficulty is likely to be encountered in the procurement of other materials. Concrete slabs make good substitutes for wood plank in crossings. They have given good service on many heavily-traveled highways, and where they can be obtained they can be used to advantage. If the manufactured prod-

Substitutes for Plank Floors

In view of the continued critical situation as regards lumber, what substitutes can be used or methods employed to maintain or carry over planked floors and platforms, which are subjected to heavy trucking?

Turn Old Plank Over

By GENERAL INSPECTOR OF BUILDINGS

The first requirement for surfaces subjected to heavy trucking is that they be smooth, while, of only slightly less importance, they should be highly resistant to wear to avoid frequent

interruptions to operations for the purpose of making repairs. Also, in view of the amount of business being handled at present through freight houses and warehouses and over platforms, the replacement of wood floors with concrete should be avoided because of the time required to prepare the foundation, place the con-

crete and allow it to cure. On the other hand, I know of no better surface than concrete for floors and platforms subjected to heavy trucking, provided time is available for the construction and curing necessary to insure a perfect job.

If the plank now in service is not decayed, is otherwise sound and has not been allowed to become too badly worn, it may be carried for a considerable time by turning it over, although this may require some expert work in the way of shimming. I also suggest the possibility of using reclaimed bridge timbers salvaged from trestles. If they are of satisfactory quality, they can be sawed to the desired dimensions and used to replace all or a part of the floor, and some of the material thus released is quite likely to be suitable for patching, or even construction, elsewhere.

Not Always What We Want

By SUPERVISOR OF BRIDGES AND BUILDINGS

We are faced with a situation today in which we cannot have many of the materials that we have been ac-

customed to look upon as necessary to maintenance. We must, therefore, take what we can get and use it to the best advantage. Some years ago we applied an asphalt mastic over several wooden platforms that had become worn enough to make trucking somewhat difficult. The trucking to which they were subjected was not particularly heavy, but the results were sufficiently satisfactory to lead me to suggest this treatment for worn floors and platforms during the present emergency. In this connection, I interpret the term "heavy trucking" to refer to volume rather than weight, for if the loads themselves are heavy something other than plank would probably have been used for the floor surface.

Asphalt has the advantage that it is not affected by the weather; practically, it does not wear; and the more it is used the better will be its condition. If it is placed where there is no travel over it, it will dry out and crack, but if kneaded by the passage of wheels, it remains "alive" and has long life. Obviously, care will be required to make the application, but the manufacturer will supply the instructions necessary to insure success.

How Tight Should Bolts Be?

When laying rail, should the bolts be drawn to a high or a low tension? Why? Does this differ with different designs of joints? What effect will this have on subsequent tightenings?

Practice Varies

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Practice with respect to tightening bolts on new rail varies between rather wide limits, some trackmen holding that the bolts should be drawn to high tension, while others advocate low tension. The former point to the marked drop in bolt tension which always occurs with new rail within a short time after it is laid, as evidence that a high initial tension is required; while the latter believe that adjustment between the rail and joint fastenings will take place under more favorable circumstances if the bolt tension is low.

Both observation and experience lead me to conclude that the better practice lies somewhere between these extremes. The joint bars should be drawn snugly enough against the rail to support the ends under traffic, but they should not be pulled up so tight that they are distorted or placed under

undue stress. Practically every road today has bolt tighteners of the latest designs, which can be set, theoretically at least, to kick off at any desired bolt tension. It does not require a large amount of experimental work to determine the desirable tension at which the machine should be set.

Uniformity of tension is almost as important as the right amount of tension. Modern rail gangs are equipped with many mechanical devices, and a rail gang is organized to insure that every operation will move forward at the same pace. No unit can be allowed, therefore, to fall behind those in advance or to delay those following. Experience has shown that, even with the most careful operation of the bolt tighteners, all bolts are not drawn to the same tension. Obviously, the bolting unit does not have the time necessary to stop and examine the joints after the bolts are tightened or to retighten any bolts that may be under too low a tension, for this will delay this phase of the work.

I have found it better to allow the bolting unit to proceed, and to assign

a man with a wrench to follow behind, testing the bolts and tightening any that have not been drawn up to the desired tension. If this is done, I am sure that we will get longer life and better service out of the bolts, the joint bars and the rail.

No matter how carefully the joints are fitted to the rail initially and regardless of whether the contact surfaces between the rail and joint bars were lubricated when the bars were applied, some adjustments within the assembly will take place under traffic. Invariably, this results in a release of part of the initial tension in the bolts, for which reason a second tightening should follow at an interval that is determined largely by the volume and speed of traffic.

Takes Middle Ground

By E. L. BANION

Roadmaster, Atchison, Topeka & Santa Fe, Topeka, Kan.

In rail-end maintenance, there are as many methods of tightening bolts as there are designs of rail joints. It occurs to me that the middle ground between high and low tension is the most desirable. If most satisfactory results are to be obtained, there should also be uniformity of tension in the bolts and, incidentally, uniform pressure on the spring washers. But to dismiss the subject by demanding merely a uniform tension is not only to ask for a result that cannot always be attained through the initial wrenching, but likewise evades the issue.

In this connection it is well to consider a triennial rail-end greasing and bolt-tightening program, to provide full lubrication under the joint bars and insure tight bolts at all times. The theory and practice of providing a uniform bolt tension can become practical only if each step necessary to secure the desired results is followed through rigidly.

These steps are (1) the use of new bolts, regardless of whether new or released rail is to be laid; the salvage value of the second-hand bolts is low, being dependent on the type of threads on the bolts; (2) rail end lubrication is necessary for uniform bolt tension and, since a lubricant is desired, a metal preservative is seldom justified for this purpose, and neither should a heavy sticky asphalt mixture be used under the joint bars; (3) to make the lubricant fully effective, the mill scale, rust, dirt and dust must be removed from the rail ends and the areas under the joint bars, by means of a stiff wire brush; and (4) a power wrench with a power cutout should be used to obtain uniformity in bolt tension.

If correct methods are employed and care is taken in this work, a second tightening of the bolts will not be necessary. If a power wrench is not available, hand wrenching will be necessary. However, hand wrenching should be done with wrenches having handles of the correct length to secure the desired tension. Wrench-

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es with long handles or extension handles should not be permitted on the job. The use of long handles will result in overstressing and will not only damage the bolt, but the spring washer and some types of joints as well. Some of our former designs of rail joints were damaged or even made useless by overtightening.

piles being in red cypress and the stringers of longleaf yellow pine.

When these structures were replaced, we found that a large percentage of the material was sound and of better grade than we were able to purchase new. Considering that the apparent full life of the released material had been exhausted, we were somewhat skeptical about reusing it for the same purposes. We inspected it quite carefully, and found it could be re-used safely.

This experience proved to be highly beneficial to us when we were confronted with the conditions imposed by the depression. In common with many other roads we lacked the money to buy all of the materials we needed, but because we had conserved our released materials we were able to carry out heavy repairs on some of our main-line trestles and renew out of face some of those on light-traffic lines. These latter structures, of various lengths, ranging from 6 to 12 ft. high, are still in service after periods of 12 to 15 years. For many years I have believed that too many are inclined to overlook the importance of making a close inspection of released materials with the purpose of re-using that which is suitable.

We are again confronted with a shortage of new material, although we do not now lack the money to buy it. Recently we lost by fire 168 ft. of trestle 8 ft. high, on a light-traffic line. We replaced this structure with frame bents on the old pile stubs, using second-hand material throughout, restoring traffic in 24 hours. This was less time than it would have taken to ship new material from the nearest storehouse, 155 miles away.

A few months ago, we replaced a through-truss swing span with deck and through plate girders. It was necessary to construct new piers for the girder spans and remove the pivot pier, which was constructed 21 years ago of creosoted piles and caps. Because we were required to clear the channel, we pulled the piles, which ranged from 68 to 84 ft. in length. We inspected them and found that 98 per cent were sound and fit for further use. The bolt holes were treated with a wood preservative by means of pressure bolt-hole treaters and were then plugged.

These piles were redriven to renew an open-deck trestle on one of our light-traffic lines, this bridge consisting of 29 spans, of 14 ft. length, the height being 38 ft. The entire structure is being renewed with second-hand material, except the sway bracing, which is new. This structure could not have been renewed otherwise, since we cannot obtain new piles of the required length.

It is my experience that from 40

Salvaged Material in Trestles

To what extent can salvaged materials be re-used in the maintenance of trestles? What precautions are necessary?

May Be Better Than New

By C. C. WESTFALL
Engineer of Bridges, Illinois Central,
Chicago

It is our practice to use good material that is salvaged from old trestles in carrying out our maintenance work. To some extent this is probably better practice than the use of new material. At present, this applies to creosoted timber, so far as our own road is concerned, for the untreated timber that is available to us at this time does not have long service life. The advantages of using suitable second-hand material for stringers are both economic and structural.

In general, the repairs will be applied to structures that have consumed a considerable part, or possibly nearly all of their service life. This means that if new stringers are used for repairs, they will not have nearly exhausted their usefulness by the time the structure must be renewed. Furthermore, the stringers in an old bridge are generally soft over the caps, so that great care must be taken if new stringers are installed to see that they are sized at the bearings over the caps to take the load equally with the old stringers. If they are not sized correctly, they may take an undue share of the load and break.

On the other hand, if they are sized correctly to meet the conditions imposed by the old structure, their value for re-use will be reduced when they are salvaged at the time the structure is renewed. The same consideration applies to new ties used for spot replacements. We have also found that in many cases creosoted piles can be pulled economically, and in some instances we have used such piles for driving new trestles. The salvaged piles can also be used for inserting posts when making repairs.

In the re-use of second-hand creosoted timber, care must be exercised to inspect it thoroughly to make sure

that it is sufficiently sound to be re-used. Quite often, creosoted timber will look good on the outside, but not be good on the inside. For this reason, more than visual inspection is necessary to insure that it is safe for re-use. In general, careful sounding will disclose whether it is sound inside, but boring may be necessary.

Second-hand timber should not be used for making repairs unless it is at least as good as the remaining timber in the bridge in which it is to be used. In the last few years we have salvaged a large amount of creosoted material from trestles on lines which were abandoned. Many of the stringers thus recovered, although they looked good, were found to be softened at the bearing area on the caps to such an extent that they could not be reused as trestle stringers.

During the last two years we have had a plentiful supply of this salvaged material, and we have built several branch-line trestles, using pile stubs for posts, with two old stringers placed flatwise for the sills and caps, with other salvaged stringers in the deck. This made new timber necessary for only the bracing and ties. We also use salvaged stringers for overhead highway bridges, and have found them satisfactory.

Gives Numerous Examples

By L. G. BYRD
Supervisor of Bridges and Buildings,
Missouri Pacific, Poplar Bluff, Mo.

For many years I have made a close study to determine the extent to which second-hand materials, salvaged from trestles that have been replaced in kind or with structures of other types, can be re-used, not only for the maintenance of trestles but in their construction as well. Twenty-five to 30 years ago a majority of the trestles in our territory were constructed of untreated material, the

to 60 per cent of the material released when a trestle is replaced can be salvaged for similar use in other structures, and that this re-use represents an attractive saving. It is quite necessary, however, to make a careful inspection of the material by sounding and boring to make certain that no faulty material gets by. It may not be advisable to re-use some of it in structures in heavy-traffic lines because of restricted dimensions, but there are always structures on branch lines for which it will be suitable.

Must Be No Deterioration

By D. X. GREENBERG

Assistant Engineer, Missouri Pacific,
Wichita, Kan.

"A penny saved is a penny earned" is still true today when many of us are thinking in billions rather than in finite terms. In any event, it is as difficult today to get new material as it was a few years ago when we did

not have the money to buy it. It is a practice of many years standing on this road to salvage and re-use all material that is suitable for such use. During the depth of the depression when purchases were kept to the minimum, we kept our timber structures in excellent condition through the use of salvaged material.

Obviously, all of the material that is released from a structure when it is replaced, is not suitable for re-use, but I have yet to see a trestle that is being replaced in its entirety that will not release some members that are fit for re-use. Most roads have light-traffic branch lines where the service is less exacting than on heavy-traffic main lines, so that timber that must be removed from structures on the latter should last for many years on the former. There is one precaution that must always be observed, however, and that is that timber for re-use in trestles must show no signs of deterioration. It must also be of sufficient section to carry the load that will be imposed on it.

other types of equipment, be trained to take care of field repairs to the best of their ability, particularly at this time when the shortage of both labor and material is so acute. Careful operation, together with good field maintenance will save both labor and material, increase efficiency and lengthen the life of the car or other equipment.

Many Men Now Know How

By DISTRICT ENGINEER

When motor cars first began to be employed generally a little more than a quarter-century ago, railway men knew practically nothing about the internal combustion engine, except the water-service repairmen who had been wrestling with the gasoline engine in pumping service for almost two decades. At that time the organization for maintaining work equipment was just beginning to crystallize, the major emphasis being on motor cars. Section foremen were hampered by motorcars that became temperamental at times, and tried to fix them, usually without success or, at best, with indifferent success. In fact, many cases occurred when track work suffered by reason of the attention that was given to the motor car.

Today the situation is far different. The almost universal use of the automobile has raised a generation that is surprisingly familiar with engines and their operation, many of whom are as well qualified to make adjustments as the regular work-equipment maintainers. I do not favor allowing foremen and operators unlimited license to repair motor cars, but they should be able to make all necessary adjustments and most field repairs.

Permission to make adjustments and field repairs should be given with some judgment, however, for men are not all equipped equally with mechanical sense. Others are inclined to be careless or indifferent. To this class belongs the man whose car is always dirty and looks neglected. It is seldom lubricated or it may have an overdose of oil; the spark plug is dirty or does not function for other reasons; his belt slips and may be oil-soaked; and some of the bolts will be loose or missing. It is completely useless to depend on a man of this type.

In contrast with this, the majority of foremen and operators are alert, interested, and mechanics of enough ability to make every class of field repairs and adjustments that are required to insure that the car will perform satisfactorily. They should be coached, however, by the regular repairman and instructed about the things that should be watched.

Repairing Motor Cars

To what extent should foremen or operators be expected or permitted to repair or make operating adjustments on motor cars? Other types of work equipment? Why?

Depends on Ability

By C. R. KNOWLES

Superintendent of Water Service (Retired)
Illinois Central, Chicago

Foremen or operators of motor cars should make such repairs to motor cars as they have the ability to make. Good motor-car operation includes certain items of field maintenance; in fact, the two are so intimately related that, in some respects, it is difficult to say where operation ends and maintenance begins.

However, the extent to which repairs may be made by the operator depends largely upon his ability, his initiative and the interest he takes in the operation of the car. Some operators seem to be wholly lacking in mechanical sense and have difficulty even in replacing spark plugs or batteries. Others show a complete lack of interest and neglect the simplest details of operation, even that of lubrication. On the other hand, quite often, operators are found who are fully qualified to make any field repairs that can be made by a regular motor-car repairman. As a rule, signal maintainers and water-service repairmen have sufficient mechanical

ability to handle all field maintenance.

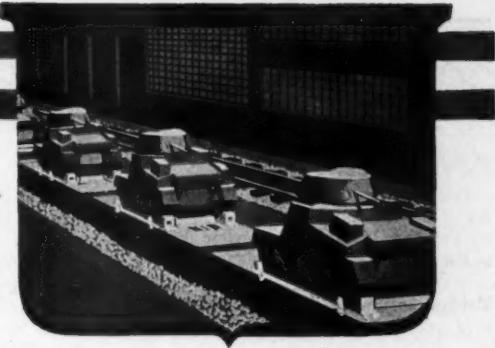
A good motor-car operator should be entirely familiar with the construction of the car and the engine and should have enough mechanical ability to make minor repairs and adjustments as they are required. Ordinary operation implies the necessity for correct lubrication, frequent inspection, the adjustment of moving parts when needed, the tightening of loose bolts and nuts, cleanliness and intelligent care of the car in other ways. If these are done promptly and systematically, the necessity for repairs will be reduced.

Records of cars in continuous service for periods of eight to ten years indicate that many of the repairs required by motor cars results from the abuse they receive by reason of poor operation. While motor car operators should be encouraged to make all repairs possible in the field, they should not be allowed to tinker with the car or engine, or to make unnecessary adjustments. This applies particularly to the carburetor and magneto. Repairs or adjustments should be made by one having knowledge of their construction and operation.

It is essential that the operators of motor cars, as well as operators of

NEWS

of the Month



F.B.I. Will Fight Ticket Black Market

A definite step toward eliminating the scalping of and profiteering in railroad tickets was taken last month when it was announced that various branches of the Federal Bureau of Investigation will transmit to the bureau's headquarters all information received about persons guilty of this practice. The F.B.I. Washington headquarters will then turn the information received over to the Office of Defense Transportation for handling in conjunction with local authorities of the communities in which the offenses occur.

Railroads Spent 135 Million in 1943

The railroads of America have received approval of the Office of Defense Transportation and the War Production Board to spend a total of \$134,968,171, in 1943, on a total of 3,629 projects, according to a recent ODT press release. The list of projects included signaling and centralized traffic control; bridges, trestles and culverts; main tracks, yard, passing and other tracks; mechanical facilities, including fuel and water stations; freight and passenger station facilities and others.

Second Quarter Steel Allocations Made

Domestic transportation agencies will receive for this year's second quarter 1,812,000 tons of carbon steel, or 94.5 percent of the 1,917,325 tons requested by the Office of Defense Transportation. This allotment, accompanied by proportionate allotments of alloy steel, copper and aluminum, said the ODT announcement, constitutes the largest amount made available since the ODT became a claimant agency under the War Production Board's Controlled Materials Plan. This year's first-quarter allotment was 1,538,645 tons.

Railroads Short 109,000 Workers in January

American railroads reported for the month of January a need for 109,000 employees as compared to a total of 111,000 wanted on December 1, according to a statement issued recently by the Railroad Retirement Board. This estimate for the entire industry is based upon reports from 192 employers, which showed

an existing need for 98,600 additional workers. More acute personnel shortages developed along the Atlantic and Pacific Coasts, but they were more than offset by easier labor supply conditions in the remainder of the country, especially in the Northern areas. Fewer laborers were needed on January 1 than a month earlier, but more trainmen and enginemen and more skilled shop workers were required.

A.A.R. and O.D.T. To Ask Labor Shortage Help

The Selective Service Board and the War Manpower Commission will be asked to help solve the manpower shortage problem of the railroads, according to a statement of O.D.T. Director Eastman and John J. Pelly, president of the Association of American Railroads, following a special meeting of representatives of the O.D.T. and members of the A.A.R. in Chicago on February 3.

In discussing the manpower shortage, Mr. Pelly said that approximately 270,000 men have been taken from the railroads for the armed forces and that they will lose about 84,000 more to selective service within the next six months unless relief is afforded. A more liberal application of deferment of necessary employees will be sought, while a request may be made for the release of some railroad workers from military service.

Railroad Men Asked To Put Back Pay In War Bonds

As part of an effort to have railroad workers invest all or part of the "windfall" coming to them in the shape of retroactive pay increases resulting from recently-affected wage adjustments, Secretary of the Treasury Morgenthau last month telegraphed the following message to the presidents of Class I railroads:

"Now that wage rates of your employees have been determined on a basis involving considerable retroactive pay, I ask your cooperation in persuading the men and women of your organization to invest as much as possible of this retroactive pay in war bonds. There is a joint War Bond committee on practically every American railroad, usually headed by an executive officer. We are asking the help of these committees, but your own influence and support as head of the organization is important. Please urge your

workers to invest a maximum portion of their retroactive pay in war bonds.

Transportation Facilities Are Less

Despite the fact that many efforts have been made to relieve the situation, transportation facilities in the United States are now less than at the beginning of the war, according to a statement made by O.D.T. Director Eastman before the Second Wartime Warehousing Industry conference in Chicago on February 16.

In reviewing the general transportation situation Mr. Eastman declared that "Our stock of transportation facilities is, on the whole, less than it was when the war began. Railroad trackage and yards have been expanded and improved to some extent in places where the need was greatest; there has been some, but not a large, increase in the aggregate capacity of locomotives and freight cars; two great new pipelines have been built. On the other hand, we have lost the use of all of our intercoastal, most of our coastwise, and some of our Great Lakes shipping. The new trucks, buses, and street cars that have been built have fallen far short of normal replacements . . . and the whole highway transportation industry has been plagued by the rubber shortage, and to a lesser extent by gasoline scarcities."

WPB Amends Permit to Facilitate Construction

As a means of facilitating the carrying out of minor construction projects necessary in the wartime operation of the railroads, the War Production Board recently issued an amended version of preference rating order No. P-142 by which operators are allowed to secure \$2500 worth of material under the procedure applicable for maintenance materials.

For construction permitted under order L-41, operators of transportation systems may now obtain material costing up to \$2500 for any one project (exclusive of labor) under P-142, or may withdraw material up to this amount from their inventory. Additional materials may be withdrawn from inventory after the project has been authorized (form WPB-617). Replacements for inventory above the \$2500 limit are obtainable by using the ratings assigned to the project (currently AA-3).

Association News

Roadmasters' Association

President E. L. Banion has called a meeting of the Executive Committee in Chicago on Tuesday, March 14, to review the work of the association.

Bridge and Building Association

President J. L. Varker has called a meeting of the Executive Committee in Chicago on April 24 to review the work of the Association and especially that of the technical committees, all but one of which have received their appointments and are now at work.

Metropolitan Maintenance of Way Club

The February meeting of the club was held at the Hotel Governor Clinton, New York, on Feb. 25. Following dinner, the meeting was addressed by Harcourt C. Drake, director of research, Sperry Rail Service, who spoke on "Rail Defects—Some Present-Day Aspects of This Growing Problem." Mr. Drake's remarks were illustrated by slides.

Maintenance of Way Club of Chicago

A total of 184 members and guests attended the meeting on February 28, at which F. G. Campbell, assistant chief engineer of the Elgin, Joliet & Eastern, and president of the club, presented a description of the installation of 5.52 track miles of continuous butt-welded rail on his road during the fall of 1943. The paper was followed by a 25-minute motion picture of the complete rail renewal work, from the welding of the rail to its final installation in track. The next meeting of the club, for which an interesting program is now being arranged, will be held on March 27.

American Railway Engineering Association

As pointed out elsewhere in this issue, plans have been completed for the forty-fourth annual meeting of the association, at the Palmer House, Chicago, on March 14-16. Only one committee held a meeting during February, this being the Committee on Impact, which met in Chicago on February 16.

About the middle of February, the secretary's office sent out Bulletin No. 444, containing the last of the reports to be presented at the forthcoming annual meeting. This bulletin contains the reports of the committees on Ties, Wood Preservation, Roadway and Ballast, Track and Rail, as well as Prof. H. F. Moore's Tenth Progress Report of the Joint Investigation of Fissures in Railroad Rails.

Early in March, the Year Book bulletin of the association, No. 445, will be mailed to members, this bulletin to include the program of the annual meeting, the secretary's report and a complete list of members.

Personal Mention

General

H. P. Lessler, roadmaster on the Denver & Rio Grande Western at Helper, Utah, has been promoted to assistant trainmaster, with the same headquarters. **R. F. Exline**, roadmaster at Walsenburg, Colo., has been transferred to Helper, succeeding Mr. Lessler.

H. H. Gudger, division engineer of the Missouri-Memphis divisions of the Missouri Pacific, has been promoted to assistant superintendent of the Memphis division, with headquarters at Wynne, Ark., succeeding **R. M. Smith**, whose appointment as division engineer at Wichita, Kan., is reported elsewhere in these columns.

S. J. Hale, assistant superintendent of the Radford division of the Norfolk & Western, with headquarters at Radford, Va., and an engineer by training and experience, has been promoted to superintendent of that division. Mr. Hale was



S. J. Hale

born at Calloway, Va., and entered the service of the Norfolk & Western as an axman in the engineering department of the Pocahontas division in December, 1906, becoming a chainman in 1907. After serving as rodman and transitman, Mr. Hale was advanced to resident engineer in 1917. In 1936 he was appointed roadmaster of the Radford division, and in March 1938, was advanced to assistant superintendent of the Shenandoah division. Transferred to the Pocahontas division five months later, he was again moved to the Radford division in February, 1942. Mr. Hale continued in the latter capacity until his present appointment as superintendent of the Radford division.

Ernest B. Moorhouse, whose promotion to assistant manager of the Grand Central Terminal of the New York Central, with headquarters at New York, was

reported in the February issue of *Railway Engineering and Maintenance*, was



Ernest B. Moorhouse

born at Tarrytown, N.Y., on November 23, 1894. He was graduated from Columbia University in 1914 and did post-graduate work at New York University until 1917. Mr. Moorhouse entered the service of the New York Central on June 1, 1917, as a transitman, subsequently serving as assistant supervisor of track; draftsman; bridge inspector; assistant engineer, and assistant division engineer, all on the Electric division. In 1926 he was promoted to the position he held at the time of his new appointment.

Engineering

R. P. Puddester has been appointed assistant superintendent maintenance of way of the Newfoundland.

L. P. O. Exley, chief engineer of the Gulf, Mobile & Ohio, with headquarters at Mobile, Ala., has been granted a six-months leave of absence.

Frank Leslie Etchison, general roadmaster of the Northern district of the Northern division of the Atlantic Coast Line, has been appointed engineer maintenance of way with headquarters at Savannah, Ga.

C. C. Madison has been appointed assistant division engineer on the Chesapeake & Ohio, with headquarters at Russell, Ky., to succeed **F. P. Barrick**, whose promotion to division engineer at Ashland, Ky., was reported in the February issue.

H. Smolka, machine shop foreman of the New York Central, Lines West of Buffalo, with headquarters at Ashtabula, Ohio, has been promoted to maintenance of way shop superintendent, with headquarters at Elkhart, Ind., succeeding **Philip J. Jones**, who has retired after 40 years service.

J. M. Giles, division engineer of the Wichita division of the Missouri Pacific at Wichita, Kan., has been transferred to the Missouri-Memphis divisions, with headquarters at Poplar Bluff, Mo., succeeding **H. H. Gudger**, whose promotion

to assistant superintendent, with headquarters at Wynne, Ark., is reported elsewhere in these columns, and **R. M. Smith**, assistant superintendent at Wynne, has been appointed division engineer at Wichita, relieving Mr. Giles.

E. G. Brisbin, whose promotion to division engineer on the Michigan Central (part of the New York Central System), with headquarters at Jackson, Mich., was reported in the February issue, was born at Adrian, Mich., on May 5, 1898, and entered railway service on October 15, 1916, as a rodman on the Michigan Central, with headquarters at Jackson. In 1918 he was advanced to instrumentman at Niles, Mich., being transferred to Jackson two years later. From 1920 to 1941, Mr. Brisbin served as draftsman, assistant engineer, roadmaster and supervisor of track, with headquarters at Jackson, and in 1941 he was promoted to assistant division engineer, with headquarters at Bay City, Mich., the position he held at the time of his new appointment.

Clifford F. Edwards, whose promotion to division engineer on the Chesapeake & Ohio, with headquarters at Columbus, Ohio, was reported in the January issue, was born at Coshocton, Ohio, on June 1.



Clifford F. Edwards

1898, and graduated from Denison University in 1922. He entered railway service on March 3, 1924, as a rodman on the C. & O., later serving as instrumentman until April, 1925, when he was advanced to assistant cost engineer, with headquarters at Huntington, W. Va. On May 15, 1929, he was appointed cost engineer on the Hocking Valley (now part of the C. & O.), and one year later he returned to the C. & O., as assistant cost engineer. On June 1, 1936, Mr. Edwards was promoted to supervisor of track of the Ashland division, and on December 22, 1937, he was transferred to the Hocking division, with headquarters at Columbus. On December 16, 1940, he was promoted to assistant division engineer, with the same headquarters, holding that position until his new appointment.

Claude B. Bruner, whose promotion to chief engineer of the Sacramento Northern (part of the Western Pacific), with headquarters at Sacramento, Cal., was reported in the February issue, was born

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in Kentucky in 1888 and received his higher education at the University of Kentucky and the University of California. He entered railway service in 1912 with the Northern Electric (now the Sacramento Northern) on construction work on the Colusa branch, subsequently serving as assistant engineer, valuation engineer and office engineer.

Brewer C. Lawson, whose promotion to valuation engineer of the Terminal Railroad Association of St. Louis, with headquarters at St. Louis, Mo., was reported in



Brewer C. Lawson

the February issue, was born at South Ashburnham, Mass., on February 14, 1896, and received his higher education at Ohio Northern University. He entered railway service in 1917 as a rodman on the Wabash and a short time later enlisted in military service and served with the A. E. F. in France. On July 1, 1919, he returned to the Wabash as a computer in the valuation department, and on February 26, 1924, he was promoted to assistant engineer of the Moberly division. In 1927 Mr. Lawson was transferred to the St. Louis Terminal division, with headquarters at St. Louis, and three years later he was transferred back to the Moberly division, later serving on that division as a track supervisor. In 1931 he was advanced to assistant engineer in the real estate department, with headquarters at St. Louis, and a short time later he was transferred to the office of chief engineer, with the same headquarters, remaining in that position until his new appointment became effective on January 1.

Arthur P. Button, engineer of grade crossings on the New York Central Lines West of Buffalo, with headquarters at Chicago, has been promoted to designing engineer, with the same headquarters. Mr. Button was born at Schaghticoke, N.Y., on August 1, 1888, and received his higher education at Rensselaer Polytechnic Institute, Troy, N.Y. He entered railway service on March 1, 1909, as a rodman on the New York Central & Hudson River (now the New York Central), with headquarters at Albany, N.Y. In the same year he was promoted to draftsman, with headquarters at Utica, N.Y., subsequently serving in that capacity at Rome, N.Y., Albany and New York. On January 1, 1915, Mr. Button was advanced to engi-

neer of barge canal crossings, with headquarters at New York, and three years later he was appointed assistant engineer, with the same headquarters. On July 28, 1919, he was transferred to Columbus, Ohio, and on June 8, 1922, he was promoted to engineer of grade crossings, with headquarters at Cleveland, Ohio, being transferred to Chicago on October 1, 1939.

I. H. Schram, acting chief engineer maintenance of way of the Erie, with headquarters at Cleveland, Ohio, has been appointed chief engineer maintenance of way to succeed **J. C. Patterson**, who has retired after 30 years service with this company. **C. K. Scott**, acting engineer maintenance of way of the Eastern district, with headquarters at Jersey City, N.J., has been appointed engineer maintenance of way of that district to succeed Mr. Schram. **Blair Blowers**, acting engineer maintenance of way of the Western district, with headquarters at Youngstown, Ohio, has been appointed engineer maintenance of way of that district. He succeeds **H. M. Righter**, who has retired because of illness. All these changes became effective on February 1.

Mr. Schram was born at Milwaukee, Wis., on October 14, 1888, and graduated



I. H. Schram

in civil engineering from Armour Institute in 1908. He entered railway service in June of the same year as a rodman of the Erie at Jersey City, and two years later he was promoted to assistant engineer, with headquarters at Rochester, N.Y. In 1912 he was advanced to supervisor of track, with the same headquarters, and in 1913 he was appointed assistant division engineer, with headquarters at Jersey City. In 1915, Mr. Schram was promoted to division engineer of the Delaware division, being transferred one year later to the Mahoning division, with headquarters at Susquehanna, Pa. In 1918 he was appointed terminal trainmaster, with headquarters at Marion, Ohio, and two years later he was advanced to assistant superintendent, with the same headquarters. In 1921 Mr. Schram was promoted to district engineer, with headquarters at Hornell, N.Y., and in 1927 he was advanced to engineer maintenance of way, Eastern Lines, with the same headquarters. Five years later he was transferred to Jersey City, and in

December, 1943, he was promoted to acting chief engineer maintenance of way, with headquarters at Cleveland, the position he held at the time of his new appointment, effective February 1.

Mr. Scott was born at Kent, Ohio, in 1889, and entered railway service in 1913 as a transitman of the Erie at Huntington, Ind. One year later he was promoted to assistant engineer, with headquarters at Cleveland, and in 1915 he was appointed section foreman at Huntington. Subsequently he was promoted to track supervisor, with headquarters at North Judson, Ind., and to assistant division engineer, with headquarters at Meadville, Pa. A short time later Mr. Scott was advanced to division engineer, serving in that capacity at Scranton, Pa., and Youngstown. In June, 1937, he was promoted to superintendent of the Marion division, with headquarters at Huntington, and in November, 1940, he was transferred to Salamanca, N.Y. In November, 1943, Mr. Scott was advanced to acting engineer maintenance of way of the Eastern district, the position he held at the time of his new appointment.

Mr. Blowers was born at Troupsburg, N.Y., on April 28, 1893, and graduated in civil engineering from Columbia University in 1913. He entered railway service in that year as a rodman on the Erie at Hornell, N.Y., subsequently serving as transitman, and chief of corps in the engineering and maintenance of way department at Hornell; Warren, Ohio; Susquehanna, Pa., and New York. From 1917 to 1919 he served in the U.S. Army, and returned to the Erie in the latter year as general yard foreman at Susquehanna. In 1920, Mr. Blowers was advanced to track supervisor, serving in that capacity at various points until 1922 when he was appointed assistant engineer, with headquarters at Rochester, N.Y. On January 1, 1926, he was promoted to division engineer, with headquarters at Dunmore, Pa., being transferred to the Jersey City Terminal division in 1927, and to Hornell in 1929. In January, 1934, Mr. Blowers was transferred to Jersey City, and in December, 1942, he was advanced to acting engineer maintenance of way of the Western district, holding that position until his new appointment.

E. E. Mayo, assistant chief engineer of the Southern Pacific, Pacific Lines, with headquarters at San Francisco, Cal., has been promoted to chief engineer, Pacific Lines, with the same headquarters, succeeding **Walter H. Kirkbride**, who has retired after 42 years service. **C. J. Astrue**, assistant to the chief engineer, has been advanced to assistant chief engineer, with headquarters as before at San Francisco, relieving Mr. Mayo, and **R. C. Nissen** has been appointed assistant to the chief engineer, replacing Mr. Astrue.

Mr. Mayo was born at Springfield, Mo., on September 13, 1885, and received his higher education at the University of Oregon. He entered railway service in February, 1907, as a levelman on location for the Pacific Railroad & Navigation Company (now part of the Southern Pacific), later serving as transitman and resident engineer on construction. When

this company was taken over by the Southern Pacific in 1912, Mr. Mayo was appointed an assistant engineer on the latter road, being promoted to roadmaster on the Portland division in July, 1913. Seven years later Mr. Mayo was further advanced to assistant division engineer of



E. E. Mayo

the Salt Lake division, and in October, 1920, he was promoted to division engineer of the Portland division, being transferred to the Sacramento division in May, 1922. From November, 1923, to May, 1926, he served as assistant engineer in charge of second track construction in the Sierra Nevada mountains and from May to June of the latter year he was on special duty assisting engineering forces in the construction of new lines of the Southern Pacific of Mexico. Following the completion of this assignment, he was appointed assistant engineer at San Francisco and, in October, 1934, he was promoted to the position he held at the time of his new appointment, effective January 31.

Mr. Astrue was born at Niles, Cal., on June 12, 1888, and received his higher

education at St. Mary's College, Oakland, Cal. He entered railway service in May, 1906, as a rodman of the Southern Pacific at Oakland, later serving as levelman, transitman and draftsman on the Western division, with the same headquarters. In January, 1909, he was advanced to office engineer and assistant

engineer of the Western division. In 1912 he was transferred to the Portland, Eugene & Eastern (then part of the Southern Pacific but since abandoned), and two years later he was appointed lease agent of the Southern Pacific, with headquarters at San Francisco. During World War I Mr. Astrue served in the U.S. Navy, returning to the Southern Pacific in March, 1919, as an assistant engineer, with headquarters at San Francisco. In June, 1925, he was appointed chief draftsman in the maintenance of way department, and in 1929 he was advanced to office engineer. In November, 1937, Mr. Astrue was promoted to the position he held at the time of his new appointment, effective January 31.

Mr. Kirkbride was born at Pueblo, Colo., on January 22, 1874, and graduated in civil engineering from Stanford University in 1895. After serving as a United States deputy mineral surveyor, he entered railway service in 1898, as an assistant engineer on the location and construction of the Sierra Railway of California. In 1902 he went with the Southern Pacific as an assistant engineer, and was promoted to division engineer in 1909. In 1917, Mr. Kirkbride was trans-



Walter H. Kirkbride



C. J. Astrue

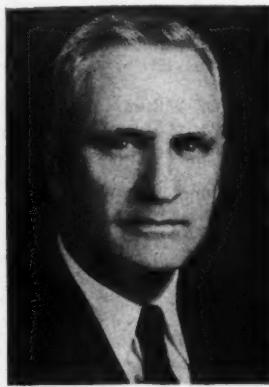
education at St. Mary's College, Oakland, Cal. He entered railway service in May, 1906, as a rodman of the Southern Pacific at Oakland, later serving as levelman, transitman and draftsman on the Western division, with the same headquarters. In January, 1909, he was advanced to office engineer and assistant

ferred to the operating department as assistant superintendent of the Sacramento division. A year later, during federal control of the railroads, he was appointed chief engineer of the Southern Pacific system lines, and at the termination of federal control in 1920, he was appointed engineer maintenance of way and structures of those lines, holding that position until April, 1932, when he was promoted to chief engineer. Among projects with which he has been associated were the new Redding-Delta line around Shasta Dam; the Martinez-Benicia double-track bridge, longest west of the Mississippi; the Los Angeles Union Passenger Terminal; the extensive San Jose line change; the San Joaquin Valley line reconstruction and relocation in Soledad Canyon after the 1938 floods; and the construction of the 400-ft. span crossing the Colorado River at Yuma, Ariz.

Mr. Kirkbride was a director of the American Railway Engineering Association in 1925-28; he is a member and now president of the Seismological Society of America; he is also past president and

director of the San Francisco section of the American Society of Civil Engineers.

Edgar Bennett, whose promotion to chief engineer maintenance of way, Central Lines, of the Southern, with headquarters at Knoxville, Tenn., was reported in the February issue of *Railway Engineering and Maintenance*, was born on May 26, 1886, at Irvington, Ky.



Edgar Bennett

He attended Kentucky State University from 1905 until 1909, and entered railway service in September, 1909, as rodman and transitman of the Southern at Danville, Ky. He then served successively as assistant engineer, engine house construction and terminal improvement; assistant engineer, maintenance of way; and resident engineer, Southwestern district, at Chattanooga, Tenn. In April, 1920, he was appointed assistant engineer, also at Chattanooga, and five years later was named roadmaster of the New Orleans & North Eastern and New Orleans Terminal (both Southern subsidiaries). Mr. Bennett became engineer, maintenance of way, at Macon, Ga., in July, 1927, being transferred to Knoxville the following year; and was advanced to the position of assistant chief engineer, maintenance of way and structures, Central Lines, in August, 1934. He served in this capacity at Knoxville until his present appointment as chief engineer, maintenance of way and structures, Central lines, with the same headquarters.

Frederick P. Barrick, whose promotion to division engineer on the Chesapeake & Ohio, with headquarters at Russell, Ky., was reported in the February issue, was born at Zanesville, Ohio, on May 15, 1902, and obtained his higher education at Denison university. After a period of employment in the office of the city engineer at Newark, Ohio, Mr. Barrick entered the service of the C.&O. on June 23, 1924, as a chainman at Richmond, Va. On May 15, 1925, he was promoted to rodman, and after a month in this capacity, he was further advanced to levelman, being appointed assistant cost engineer, with headquarters at Ashland, on August 5 of the same year. On January 1, 1927, Mr. Barrick became assistant cost engineer of the entire Big Sandy division. On May 15, 1929, he was further promoted to supervisor of track, in which capacity he remained until June 1, 1936, when he was further ad-

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vanced to assistant division engineer of the Ashland-Big Sandy divisions, with headquarters at Ashland. He remained in the latter position until January 18, 1941, when he was transferred to the Russell (Ky.) terminal, where he was located at the time of his recent promotion to division engineer at Ashland, which was effective on January 1.

R. R. Smith, whose promotion to assistant district engineer of the New York Central, Lines West of Buffalo, with headquarters at Toledo, Ohio, was reported in the February issue of *Railway Engineering and Maintenance*, was born at Buffalo, N.Y., on April 1, 1895, and received his higher education at Syracuse University. He entered railway service on May 1, 1920, with the engineering corps of the New York Central at Buffalo, and in 1925 he was appointed assistant supervisor of track, with headquarters at Charlotte, N.Y. In 1935 Mr. Smith was transferred to Richland, N.Y., and in 1936 to Batavia, N.Y. In 1940 he was promoted to division engineer, with headquarters at Jersey Shore, Pa., and two years later he was transferred to Toledo, Ohio, remaining in that location until his new appointment became effective on January 15.

V. R. Walling, superintendent of the Chicago & Western Indiana and the Belt Railway of Chicago, has been promoted to assistant chief engineer of both roads, with headquarters as before at Chicago, a newly-created position.

J. P. Morrissey, track supervisor on the Eastern district of the Erie, with headquarters at Dunmore, Pa., has been promoted to assistant division engineer, with headquarters at Salamanca, N.Y., succeeding **P. J. Seidel**, who has been transferred to Hornell, N.Y.

Track

M. J. O'Connor, assistant supervisor of track on the Pittsburgh & Lake Erie, has been promoted to supervisor of track, with headquarters at Beaver Falls, Pa., succeeding **John F. Forst**, whose death on January 16 was reported in the February issue.

O. P. Hansen, assisting supervisor of track on the Baltimore division of the Pennsylvania, has been promoted to supervisor of track on the Grand Rapids division, with headquarters at Grand Rapids, Mich., succeeding **H. B. Sutherlin**, who has retired.

S. W. Schaumburg, section foreman of the Chicago Great Western at Clarion, Iowa, has been promoted to roadmaster, with the same headquarters, succeeding **T. Bloomfield**, who has been transferred to Stockton, Ill., replacing **H. H. Sukow**, who has resigned.

Albert S. Barr, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Akron, Ohio, was reported in the December issue, was born at Pittsburgh, Pa., on April 22, 1914, and graduated in civil engineering from the University of Pittsburgh in 1936. He entered railway service with the Pennsyl-

vania as an assistant on the engineering corps, with headquarters at Erie, Pa., later being transferred to Niles, Ohio; Johnstown, Pa.; Wellesville, Ohio, and Coshocton. In October, 1940, Mr. Barr was promoted to assistant supervisor of track, with headquarters at Jamesburg, N.J., and in April, 1941, he was transferred to North Philadelphia, Pa., remaining in that location until his new appointment.

J. T. Flynn, general foreman on the Erie at Buffalo, N.Y., whose promotion to supervisor of track, with headquarters at Dunmore, Pa., was announced in the February issue of *Railway Engineering and Maintenance*, was born at Elmira, N.Y., on October 5, 1905. Mr. Flynn attended Elmira Free Academy and entered railway service in May, 1923, as a trackman on the Erie at Elmira, serving subsequently as a timekeeper at the same point, as an inspector at Binghamton, N.Y., and as a signalman on the Susquehanna division. From May 16, 1929, to May 31, 1940, Mr. Flynn served in the capacities of rodman, levelman and transitman on various divisions of the Eastern district. He then became chief of a curve-lining corps at Jersey City, N.J., being advanced to senior transitman at the same location on September 4, 1940, and to head of the corps on July 31, 1941. On January 11, 1943, he was promoted to general yard foreman at Buffalo, N.Y., which position he held until his recent promotion to track supervisor at Dunmore.

Bridge and Building

Edward Pagels, foreman of bridges and buildings on the Northwestern Pacific (a subsidiary of the Southern Pacific), with headquarters at Sausalito, Cal., has been promoted to supervisor of bridges and buildings, with the same headquarters.

James G. Fisk, bridge and building inspector on the St. Lawrence division of the New York Central, with headquarters at Watertown, N.Y., has been promoted to assistant supervisor of bridges and buildings, with the same headquarters, to succeed **F. H. Smith**, deceased. **Richard M. Powers**, bridge and building foreman, has been promoted to bridge and building inspector at Watertown to replace Mr. Fisk.

Obituary

John G. Brennan, assistant to the vice-president of the New York Central system, with headquarters at Washington, D.C., and an engineer by training and experience, died in that city of February 23.

Louis J. Owens, assistant engineer on the Chicago, Burlington & Quincy, with headquarters at Chicago, died in a hospital in that city on February 13.

William Mahan, an inspector of the Wheeling & Lake Erie, with headquarters at Cleveland, Ohio, who previously served that road for a considerable time as superintendent of bridges and buildings

at Brewster, Ohio, died at Cleveland recently.

Frank Ringer, chief engineer of the Missouri-Kansas-Texas, with headquarters at St. Louis, Mo., died at a hospital in that city on February 6, at the age of



Frank Ringer

74. Mr. Ringer was born at Paola, Kan., on August 17, 1869, and graduated in civil engineering from Kansas State University in 1893. He entered railway service with the Missouri, Kansas & Texas (now the M-K-T), in June, 1894, with which road he remained up to the time of his death. In May, 1895, he became office engineer in the office of the chief engineer, with headquarters at Dallas, Tex., and from 1902 to 1905 he was assistant engineer in charge of surveys for revisions of line and grade, with the same headquarters. In the latter year he was promoted to resident engineer maintenance of way, with headquarters at Parsons, Kan., and one year later he was advanced to principal assistant engineer in charge of revisions of line and grade, with the same headquarters. In 1911 he was promoted to assistant chief engineer, with headquarters at St. Louis, and in 1912 he was advanced to engineer maintenance of way at Parsons. In March, 1913, Mr. Ringer was appointed superintendent of transportation and maintenance of way, with headquarters at Muskogee, Okla., and in October, 1914, he was re-appointed engineer maintenance of way, with headquarters at Parsons. In June, 1917, he was promoted to the position he held at the time of his death. Mr. Ringer was chairman of a joint committee on Grade Crossing Protection of the A.A.R. He was also a past director of the A.R.E.A.

Booklet on Schramm Air-Compressors. —Schramm, Inc., West Chester, Pa., has published a 16-page illustrated booklet featuring the corporation's line of portable and stationary air-compressors. The illustrations include pictures of the various sizes and types of compressors manufactured, the units in actual operation and compressor installations when completed. Each unit shown is accompanied by descriptive text, a table of specifications and photographs of various models.

Supply Trade News

General

Second and third star renewals of its Army-Navy "E", and Navy "E" awards have been presented to two plants of the **Worthington Pump and Machinery Corporation**, Harrison, N.J. The two "E" awards constitute the 12th and 13th honors to be accorded the management and workers of the Worthington organization.

Personal

Benjamin F. Affleck, who retired as president of the Universal Atlas Cement Company on September 1, 1936, died in Chicago on February 14 of a heart attack.

Harold E. Weeks has resigned as assistant sales manager of creosote and pitch sales of the Barrett division of the Allied Chemical & Dye Corporation to take charge of sales of creosote and coal-tar chemicals for the **Interlake Chemical Corporation**, Cleveland, Ohio, a subsidiary of the Interlake Iron Corporation, Cleveland, and of the Great Lakes Steel Corporation of Detroit, Mich. Mr. Weeks was associated with the Barrett organization for 27 years, during the last 20 of which he was engaged in creosote sales and for 15 years was assistant sales manager of creosote and pitch sales.

P. E. Floyd, sales manager of the Chicago district of the **Allegheny Ludlum Steel Corporation**, with headquarters at



P. E. Floyd

Chicago, has been promoted to assistant general manager of sales, with headquarters at Brackenridge, Pa. **W. G. McFadden**, assistant district sales manager at Chicago, has been advanced to district manager, succeeding Mr. Floyd. Mr. Floyd recently returned to his company after serving as chief of the Stainless Section of the Steel Division of the War Production Board at Washington, D.C. Upon his release he returned to the Chicago district management, remaining in that position until his new appointment.

Thomas MacLachlan, formerly manager of the New York office of the Vulcan

Iron Works, has been appointed general manager in charge of a new, enlarged New York and export office opened by the **H. K. Porter Company** at 50 Church street. **R. G. Newell**, who managed the New York office of the Quimby Pump Company before its acquisition by Porter, will direct activities of Porter's Quimby Pump division in New England and the New York district from the new office, and **Earl M. Bardo**, formerly with the Robinson Manufacturing Company, will be headquartered in the same office, representing Porter chemical process equipment in the same territory.

William O. Wilson, manager of the Midwest district of the **Worthington Pump and Machinery Corporation**, with headquarters at Chicago, has been promoted to commercial vice-president, with the same headquarters. In his new position, he will assume responsibility for general supervision and direction of the corporations' commercial activities in the Chicago; St. Louis, Mo.; Kansas City, and St. Paul, Minn., district office territories. Mr. Wilson has been associated with Worthington and its predecessor companies since 1898, with the exception of a two-year period from 1911 to 1913. In 1919 he was appointed district manager at Pittsburgh, Pa., and in 1928 he was transferred to Chicago. In 1937 he was advanced to the position he held at the time of his new appointment, effective February 1.

Stanley H. Smith, manager of retail sales of the **Philadelphia Steel and Wire Corporation**, Philadelphia, Pa., has been elected vice-president. He will continue to serve as president of Stanley H. Smith & Company, Cleveland, Ohio, and as vice-president of Eastern Railway Supplies, Inc., New York. Mr. Smith was born at Toronto, Ont., on August 4, 1886, and received his higher education at the University of Pennsylvania and Drexel Institute. He entered the service of the Pennsylvania Steel Company on April 1, 1906, remaining with that firm until June 1, 1917, when it was acquired by the Bethlehem Steel Company. Mr. Smith continued with the latter company and later was promoted to sales manager, with headquarters at Cleveland. He resigned in April, 1921, to form a manufacturers' agency and eight years later incorporated Stanley H. Smith & Company. A short time after he was elected vice-president of Eastern Railway Supplies, Inc.

William C. Bamber has been elected president of the **Wendell & MacDuffie Company**, New York, Eastern sales agents for the Cullen-Friestd Co. and the Russell Snow Plow Company, to fill a position that has been vacant since the death of Rufus L. MacDuffie in 1934. **J. Karel Huybers** has been elected secretary and treasurer of the company.

Robert F. Carr, president of the **Dearborn Chemical Company**, with headquarters at Chicago, has been elected chairman of the board, and **George R. Carr**, vice-president and general manager, has been elected chairman of the executive committee. **Robert Adams Carr**, vice-

(Continued on page 282)

A CONSTRUCTION AND MAINTENANCE CREW ... on wheels or crawlers

Putting a **SCHRAMM** Self-Propelled Crawler or Rail Car COMPRESSOR in the hands of even unskilled laborers is like providing infantry men with jeeps—they go places and get things done! Whether it's an emergency call on the Right of Way, or a Spur on the branch line, air power at the touch of a button enables you to do the impossible in a hurry.

Gasoline or Diesel powered models mounted on rail cars for standard track gauge can be furnished either self-propelled from same engine that drives compressor, or non-self for towing. The lightest, most compact rail car ever built. "Off-Track," Crawler type compressors are mechanically driven. Each track is independently driven by a forward and reverse clutch controlled by the operator. The units are extremely narrow, being designed to go between tracks, or on the shoulders of the "Right of Way."

From Alaska to the Equator, Construction Engineers have found **SCHRAMM** means hard-hitting dependable, economical power—regardless of temperature. For all Schramm Compressors have straight-lined cylinders, water jacketed for correct lubrication at all temperatures. . . . Mechanical intake valve. . . . Operate at most economical engine speed, using less fuel for air delivered. No auxiliaries to buy. . . . Shipped ready for action.

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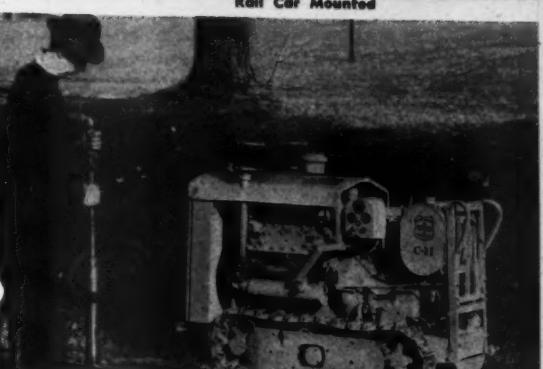
210 Cu. Ft. Self-Propelled Crawler



315 Cu. Ft. Rail Car Mounted



60 Cu. Ft. Self-Propelled Crawler Type



60 Cu. Ft. Self-Propelled Rail Car



SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER, PENNSYLVANIA

president of the railroad department, has been elected president, and **S. C. Johnson**, assistant vice-president, has been promoted to vice-president in charge of the railroad department, succeeding Mr. Robert Adams Carr. **Roger Q. Milnes**,



Robert F. Carr

assistant vice-president of the railroad department, has been advanced to vice-president in charge of the railroad department of the Western division with the same headquarters.

Robert F. Carr was born at Argenta, Ill., on November 21, 1871, and graduated from the University of Illinois in 1893. In the following year, he entered the employ of the Dearborn Chemical Company and served successively as secretary and vice-president and general manager until 1907, when he was elected president, the position he was holding at the time of his recent election. During

Railway Engineering and Maintenance

election. He is also chairman of the board of the Locomotive Firebox Company.

Robert Adams Carr was born in Oak Park, Ill., on September 21, 1903, and graduated from the University of Chicago in 1926. He entered railway service in the mechanical department of the Southern Pacific in 1927 and a year later he entered the employ of the Locomotive Firebox Company where he engaged in sales and production work. In 1934 he was appointed managing director of Dearborn with headquarters at Buenos Aires, Argentina, and in 1937, he was elected vice-president of the railroad department of this company, which position he held until his recent election.

Mr. Johnson graduated from the University of Kansas in 1921 and immediately thereafter was appointed assistant bacteriologist in the water laboratory of the Kansas State Board of Health. He entered railroad service on January 1, 1923,

chemical engineer, and assistant vice-president.

Mr. Milnes entered railroad service in the car department of the Chicago, Burlington & Quincy at Hannibal, Mo. Later he was employed by the Northern Pacific



Roger Q. Milnes



Robert Adams Carr

at Spokane, Wash., as a fireman and still later as a fireman on the Cripple Creek Short Line. In 1910 he entered the service of the Atchison, Topeka & Santa Fe as a fireman and was promoted to engineer in 1914. He resigned in 1924 to become superintendent of fuel and road foreman of the Florida East Coast and left this road in 1927 to join the staff of Dearborn as service engineer. He was promoted to assistant vice-president of the Railroad department in 1936, which position he held at the time of his recent election.

Leslie H. Hughes has been appointed advertising manager of the **Cleveland Tractor Company**, with headquarters at Cleveland, Ohio. Mr. Hughes resigned recently as advertising manager of the Brown Fence & Wire Co., Cleveland. He is a graduate of the University of Minnesota and while attending school he worked on the Minnesota Daily as college editor. He has also been associated with several other companies in an advertising capacity.

R. C. Edgar has been appointed personnel director of the **Allegheny Ludlum Steel Corporation**, with headquarters at Pittsburgh, Pa. He was previously industrial manager of the Pittsburgh Chamber of Commerce and has been engaged in publicity work for a number of years, serving in that capacity with the Westinghouse Electric & Manufacturing Co. In his new position, Mr. Edgar will have general supervision over all industrial labor relations, employment, and the safety and welfare departments of the corporation.



S. C. Johnson

World War I, he served as major on the general staff of the U. S. Purchase, Storage and Traffic division.

George R. Carr was born at Argenta on January 23, 1877, and graduated from the University of Illinois in 1901. Two weeks after graduation he joined the staff of the Dearborn Chemical Company as a salesman and served successively until 1922 as assistant general manager and general manager. In 1922 he was elected vice-president and general manager, which position he held until his recent

He entered the employ of Dearborn on January 1, 1930, and has held successive positions in the Railroad department as

Obituary

William H. Nelson, a partner in Joseph E. Nelson & Sons, a construction contracting firm of Chicago, which went out of business a number of years ago, died in a Fond du Lac (Wis.) hospital on February 2, after a lengthy illness.



Keep your
section cars rolling for
Victory—mount them on
Timken Bearings. This also
will give you a decided
advantage after
Victory.

Fairbanks-Morse No. 57 Railroad Motor Car equipped with Timken Bearings.

The most important requirement in railway section motor cars and trailers is *availability*—the quality of staying on the job; of always being ready for service.

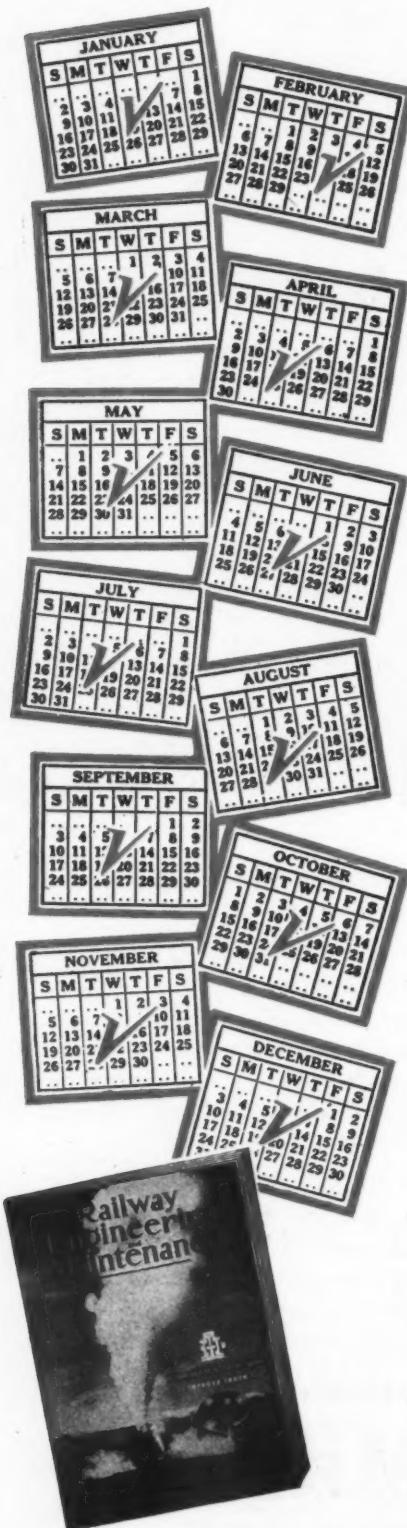
Timken Tapered Roller Bearings, more than any other one feature, help to produce this quality through their ability to prevent friction and wear; to keep radial, thrust and combined loads under constant control; to maintain wheel gauge; to extend wheel and axle life; and to simplify lubrication.

Engineers who make Timken Bearings an indispensable feature of the section cars and other equipment they design are more valuable to their companies because they produce machines that *perform better* and *sell better*—for the trade-mark "TIMKEN" indicates superiority to equipment buyers everywhere.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

Every Month In 1944



"An Exhibit Every Month"

"Boss, the A.R.E.A.'s going to meet again this month," commented the star salesman to his railway sales manager.

"I heard that, Bill. I suppose that means that they think things are getting back to normal?" replied the sales manager.

"Quite the contrary. I understand they feel that the responsibilities on the railways and especially on the maintenance officers are so great that they need all the help they can get from addresses by key men who know and from the exchange of personal experiences to assist them in carrying on."

"That sounds smart to me. They can't afford to leave any stone unturned this year. Is there going to be an exhibit?"

"No, the manufacturers can't work it out this year."

"Then we won't be able to contact our railway friends at the meeting."

"Not this year—we'll have to use another means."

"What's that?"

"Advertising in *Railway Engineering and Maintenance*. Next to personal contacts, that's the best alternative."

"I see your point. We can tell our story to these men in the advertising pages of that publication."

"That's what I have in mind. It'll reach all of those who attend the meeting and all the rest of them, wherever they are—and at a time when they can take the time to read it. That magazine can give us an 'exhibit' every month."

"You're right. We'll use it."

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

Save

MONEY...
MINUTES...
MANPOWER with

SKILSAW ON EVERY CUT!



Your Bridge and Building Crews will get more work done, in far less time, when they're equipped with fast-cutting SKILSAW! It speeds all sawing of wood, metals, stone and composition . . . cuts daps in ties . . . saws all lumber for bridges, trestles, guard rails and buildings.

SKILSAW is lighter, more compact for easier handling . . . yet it's more powerful for greater saving speed. Works from light socket or portable generator . . . goes right to each job and eliminates material handling. Economical and efficient for large or small crews. Ask for a demonstration of SKILSAW today!

SKILSAW, INC.

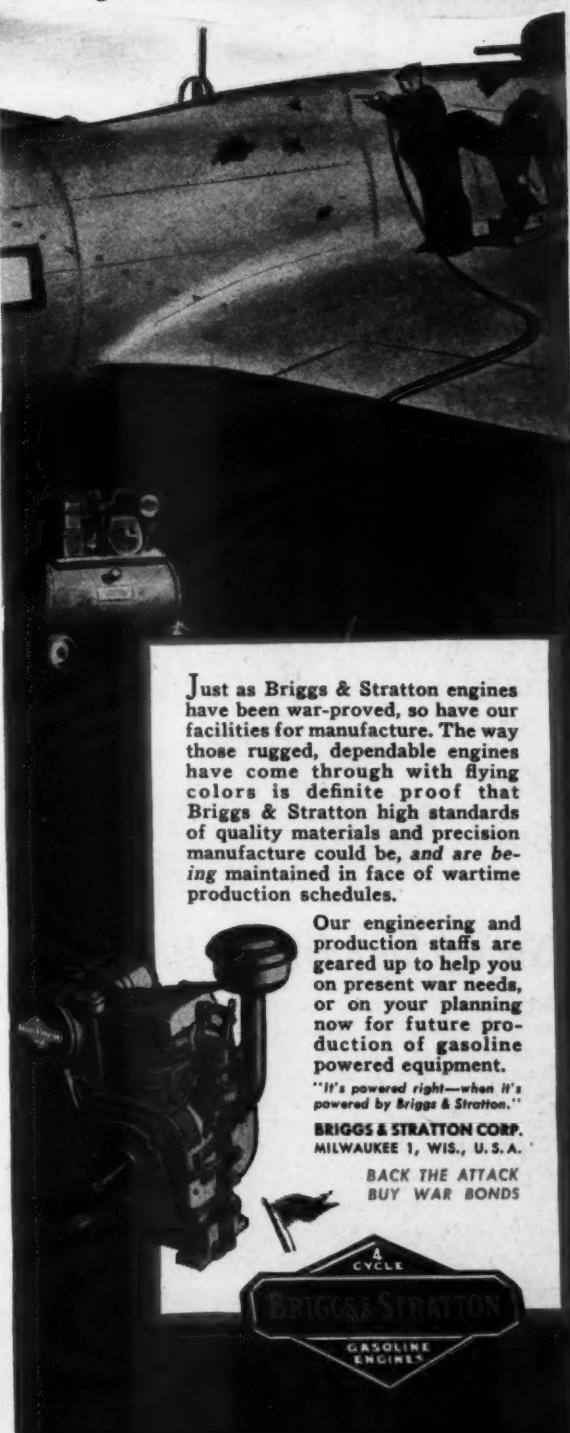
5053 Elston Ave., Chicago 30, Ill.
Sales and Service Branches
in All Principal Cities

SKILSAW PORTABLE ELECTRIC **TOOLS**
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

Railway Engineering and Maintenance

WHEN REPAIR CREWS Take Over

They're doing a great job — repairing damaged planes and other fighting equipment at front line bases. For operating riveters and other equipment, air compressors are powered by sturdy, dependable air-cooled gasoline engines. One more front line duty for the hundreds of thousands of Briggs & Stratton engines now "In Service".



Just as Briggs & Stratton engines have been war-proved, so have our facilities for manufacture. The way those rugged, dependable engines have come through with flying colors is definite proof that Briggs & Stratton high standards of quality materials and precision manufacture could be, and are being maintained in face of wartime production schedules.

Our engineering and production staffs are geared up to help you on present war needs, or on your planning now for future production of gasoline powered equipment.

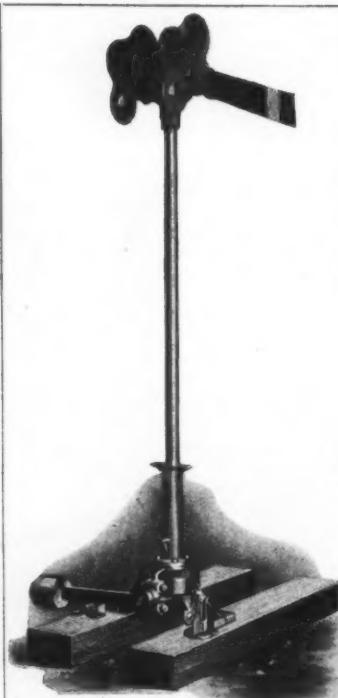
"It's powered right—when it's powered by Briggs & Stratton."

BRIGGS & STRATTON CORP.
MILWAUKEE 1, WIS., U.S.A.

BACK THE ATTACK
BUY WAR BONDS

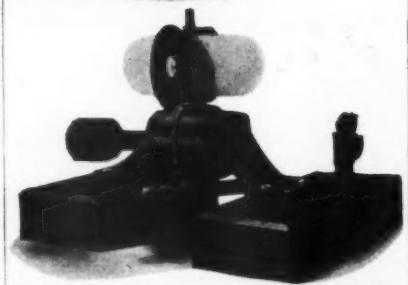


U. S. SWITCH STANDS



Low
Semaphore
Switch
Stand
with
Revolving
Lamp

Ground
or
Yard
Stand



Switch Stands Must Be Right

Few devices in railroad operation are more important than Switch Stands. They must be good. And in Switch Stands as in Water Columns, Wood Tanks and other Water Supply Equipment the name "U.S." carries with it a guaranty of experienced workmanship and scientific excellence. Their popularity with yard men is as deserved as it is genuine.

Complete Information on Request

Also Water Columns, Wood Tanks and General
Water Handling Appliances

U. S. ENGINE & PUMP CO.

Division of Batavia Metal Products, Inc.

Batavia

Illinois



STONHARD RESURFACER

Eliminates These Dangers—



By giving a non-skid, non-chipping and non-breaking surface, ideal for heavy traffic spots. With today's extra heavy travel, warehouse and storage floors, passenger and freight platforms, as well as all terminal roadways, take a terrific beating! Protect them with STONHARD RESURFACER. STONHARD RESURFACER is effective, too, in the relining of water towers and tanks.

Warehouse floors or train platforms of wood, as well as concrete, may also be easily covered with STONHARD RESURFACER. This gives a fire-resisting topping which is sparkproof! Reduces your insurance rates by thus effectively lessening fire hazards. 100 million square feet of STONHARD RESURFACER in actual use today by over 100,000 customers among railroads, public utilities, municipalities and industry.

Find out how your own maintenance problems can be solved quickly and economically by sending today for our informative 48-page maintenance guide "OVER THE ROUGH SPOTS".

STONHARD COMPANY

1323 CALLOWHILL STS.,

PHILADELPHIA 8, PA.

ATTENTION: Maintenance Engineers

SPEED UP DITCHING AND ROADBED SHAPING TO 15 TO 20 MILES A DAY, ON BOTH SIDES, WITH THE

JORDAN Composite Spreader-Ditcher



Contours and shapes the ballast; levels the berm and cuts a side drainage ditch parallel to the track. Wings quickly set from 25 to 45 degrees to cut any practical depth below top of rail and will slope the cut from the ditch outward. Plus a ballast plow which cuts from 1 to 6 inches below top of rail. Cuts foul ballast away from end of ties.

"Does the Work of An Army of Men."

O. F. JORDAN COMPANY

Walter J. Riley, Pres.

East Chicago

Indiana

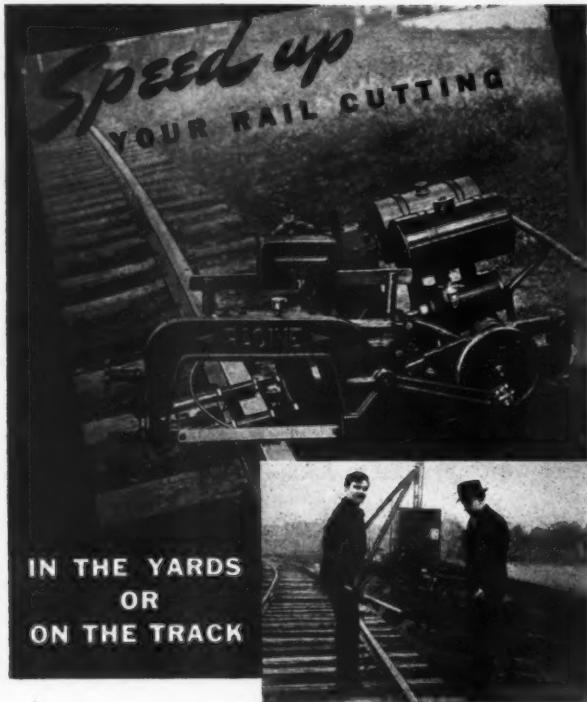
A BURRO CRANE goes to the work wherever it is, handles the job whatever it is—track laying, bridge building, pile driving, ballast spreading, excavating or general loading, unloading, or handling.

They are built low enough to ride flatcar or can travel under their own power at speeds up to 27 miles per hour. They can pull their own work train if necessary (7500 lb. draw bar pull). Can even take themselves off the track to let a train pass and be back at work in a few minutes.

Write for Bulletin



CULLEN-FRIESTEDT COMPANY
1301 S. Kilbourn Ave., Chicago 23, III.



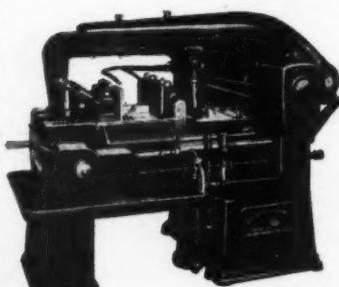
Racine High Speed Portable Rail Cutters are faithfully serving leading railroads everywhere. Crop your rail ends right on the track or in the yards without the use of heavy "on track" equipment. These machines cut fast, clean and smooth. Racine Rail Cutters are sturdily constructed, light in weight. They can be operated by one man, transported by only two men. Better fittings and stronger rail joints on curves, switches, interlockings and crossings result when a Racine low cost Rail Cutter is used. You reduce delays in train movements and help solve your manpower shortage. Available with gas engine, electric or air motors.

Request Catalog No. 58A for complete information. Address Dept. RE-S.

RACINE General Purpose

METAL CUTTING SAWS Racine's complete line of cutting machines includes all capacities from 6" x 6" to 20" x 20". Equipped with the latest control devices for simple operation, fast and accurate cutting of all metals, Racine Saws soon pay for themselves.

Models are available for either general purpose or high speed metal cutting production. If you have cutting metal work in your shop, it will pay you to investigate these modern Racine Machines.



Racine Hydraulic Heavy Duty "Shear Cut" Saw

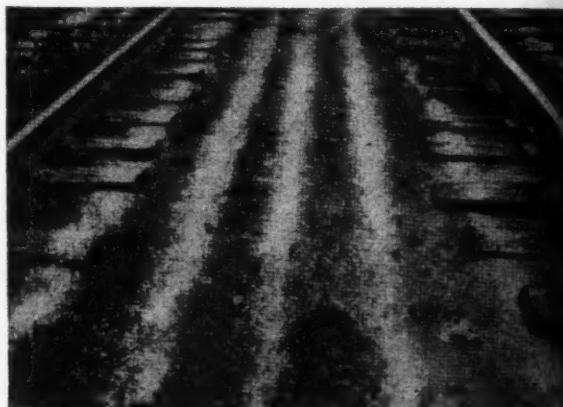
For complete information on Racine's Metal Cutting Saw line ask for Catalog No. 12.



EARLY SPRING— NOT AUGUST—IS THE TIME TO RID YOUR TRACKS OF WEEDS FOR THE YEAR!

PLAN NOW... and you'll not only keep the right of way free and clear all Spring and Summer, but also avoid drainage problems and the fire hazard incurred later from dead vegetation!

How? Use Sterling Rock Salt for weed *prevention*! Unlike ordinary "contact killers"...rock salt attacks roots *directly*! Spread in the early Spring... just as young plants show through the ground... salt percolates into roadbeds as a brine formed with rainwater—killing roots of tender, young weeds. Furthermore, Sterling Rock Salt is non-poisonous...non-inflammable and easy to handle.



Initial treatment requires only 2 to 3 lbs. of salt per sq. yd...yearly maintenance thereafter drops to 1 to 2 lbs. per sq. yd. to prevent weed recurrence. For complete details, distribution methods, blueprints for boxcar spreader attachment, etc... write for contact by an International field engineer.

Sterling ROCK SALT

ELIMINATES WEEDS!

INTERNATIONAL SALT COMPANY, INC.

Dept. RE3, Scranton, Pa.

Railway Engineering and Maintenance

LUNDIE TIE PLATES

aid NATIONAL DEFENSE

Use Lundie Tie Plates

Requiring 10% Less Steel to Manufacture

MORE than 250,000,000 Lundie Tie Plates placed in service by the railroads is an outstanding recognition that the inclined, stepped seating without tie cutting projections, essentially smooth bottom, will hold the track to gauge eliminating the use of additional spikes such as is required with flat bottom plates. These important features coupled with the fact that Lundie Tie Plates require 10% less steel to manufacture more than justifies their use for conserving critical material for the duration.



Manufactured to A. R. E. A. Specifications

Furnished in Double or Single Shoulder

THE LUNDIE ENGINEERING CORPORATION

Tie Plates—Spring Rail Clips—Safety Tongs for Handling Track Material—Aladdin Rail and Flange Lubricator
19 WEST 50th ST., NEW YORK

59 E. VAN BUREN ST., CHICAGO

The convoy leaves at midnite

Industrial Brownhoist Cranes Help Speed Ship Loading In Scores of Allied Ports • Help Speed Material Handling in Hundreds of America's Plants

In busy sea-ports all over the world Industrial Brownhoist cranes are speeding loading operations, saving thousands of man-hours in the handling of vital war materials. And in steel mills, coal yards, railroads, chemical plants and other war plants throughout the country I. B. cranes are also working night and day—seldom, if ever, requiring time out for repairs. They get more work out of a gallon of gas or fuel oil than you'd think possible. They increase the operator's efficiency because their monitor-type cabs provide 360° visibility, better ventilation and less noise. Write us for complete facts about these sturdy, time-saving, money-saving cranes. Industrial Brownhoist Corp., Bay City, Michigan. District offices: New York, Philadelphia, Pittsburgh, Cleveland and Chicago.

*Industrial Brownhoist
Builds Better Cranes*

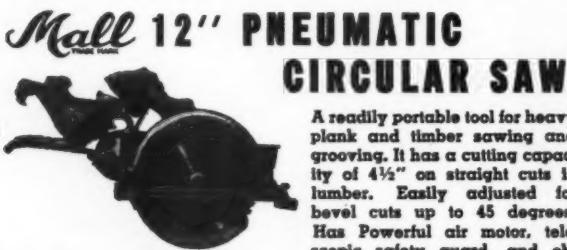


Keep Tracks Traffic-worthy



with
Mall Portable Power Tools
5 H.P.
**OFF-THE-TRACK
PORTABLE POWER UNIT**

Rail. Switchpoint. Frog and Crossing Grinding can be handled faster, better and at lower cost with this readily portable, 5 H.P. MALL gasoline-powered unit. It can be operated anywhere on the right-of-way without a generator or compressor set. It is easy to start in all temperatures . . . runs by itself . . . requires very little fuel . . . and is easily wheeled by one man. It is ruggedly constructed for long continuous service. Patented slip lock detail on ends of flexible shaft provides for quick easy change of grinding attachments. A big time and labor saver that will speed up maintenance now.



servation glass for clear vision on cutting line. Exhaust air keeps cutting line clear.

Mall PNEUMATIC CHAIN SAW



24", 36" and 48" Cutting Capacities

A powerful, high speed saw for cutting heavy timbers and piling for bridge, trestle, dock and other construction. Cuts off piling above or below water with equal facility. Unit is compact, light in weight, and readily portable. Cutting chain can be easily and quickly sharpened right on the job.

Write for literature and prices to Railroad Department

MALL TOOL COMPANY
7746 SOUTH CHICAGO AVE. CHICAGO 19, ILLINOIS



YOUR WATER SYSTEM

Might Be Called
for Extra Duty Tonight

FIRE—that killer of man and destroyer of property strikes suddenly and without warning! Standing guard, after performing its daily duty, is your water system. If it bears the name of LAYNE, be assured that it has a great standby reserve of power and productivity ready to be unleashed when the emergency call comes.

In many, many cases Layne Well Water Systems, due to their extra reserve of power and productivity, have saved untold thousands of dollars worth of property in cases of sudden emergency.

Layne Well Water Systems are specifically built to give their owners much more than normal daily operational service. They are built to give protection to property and lives.

If your city or manufacturing plant needs more water, please remember that Layne Well Water Systems produce great quantities at exceptionally low cost and at the same time provide an extra reserve of power and productivity that stand guard in cases of emergency.

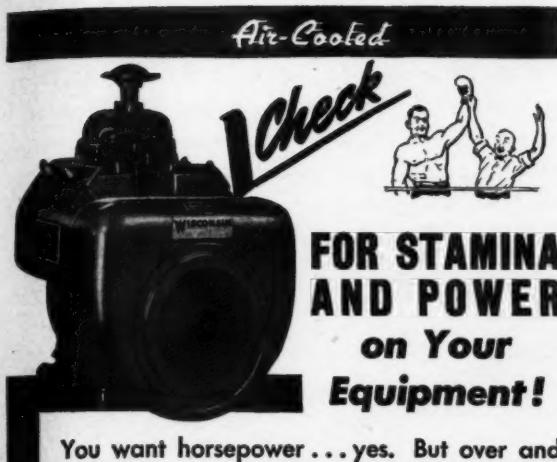
For fully illustrated literature on Layne Well Water Systems, address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Century Co., Memphis, Tenn. * Layne-Northeastern Co., Milwaukee, Wis. * Layne-Mississippi Co., Lake Charles, La. * Layne-Western Co., Monroe, La. * Layne-New York Co., New York City. * Layne-Northwest Co., Milwaukee, Wis. * Layne-Central Co., Columbus, Ohio. * Layne-Midwest Co., Houston, Texas. * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada.


WELL WATER SYSTEMS
DEEP WELL PUMPS

BUILDERS OF WELL WATER SYSTEMS FOR
EVERY INDUSTRIAL AND MUNICIPAL NEED

Railway Engineering and Maintenance



You want horsepower . . . yes. But over and above that you must have STAYING POWER. You get both in Wisconsin heavy-duty air-cooled engines. There's plenty of stamina here for slugging away, day in and day out, on those tough jobs that must be licked on schedule. Wisconsin heavy-duty design and construction can "take it".



SPEED—SAFETY—ECONOMY
In Splicing • Clamping • Repairing • Mending • Tying • Reinforcing

PUNCH-LOK Streamlined Hose Banding Method is being used in hundreds of production and maintenance jobs in all industries for connecting high-pressure hose; splicing electric cable; stopping leaks in steam and water lines; reinforcing and mending splits in crossarms and ladder rails; tying rigid conduit or flexible cable to existing pipe lines or girders; tying ends of wire or manila rope to prevent fraying—and many other jobs. PUNCH-LOK is giving wartime industries a fast, safe, economical, quality banding method. Investigate NOW the many advantages it will have for you in your present and postwar work. Let PUNCH-LOK solve your clamping or banding problems!



LOKING TOOL . . . Sturdily constructed to assure long life. Locks all size clamps with a tensile pull of 1,000 lbs. Hammer punches and breaks excess band flush at clip. CLAMPS . . . Made of flat, high tensile, galvanized steel, double wrapped. Available from $3\frac{1}{2}$ " to 48" I.D. Any large size clamp can be pulled down and made into a smaller size.

Write for descriptive catalog and name of local distributor.

PUNCH-LOK COMPANY

Dept. G, 321 N. Justine St., Chicago 7, Illinois

Rahey Engineering and Maintenance

SAVE STEEL with ARDCO

Rail and Flange Lubricators



Ardco Automatic Rail and Flange Lubricator

THE "Ardco" model is operated by the recurrent wheel depression of a drive spring, thereby causing grease to flow from precisely positioned ports—so located that grease contacts the flange of each passing wheel—thus efficiently lubricating both flange and rail as the curve is traversed.

The "Sesmo" type is similarly effective. This lubricator, however, is actuated by rail wave motion and is not dependent upon wheel impact.

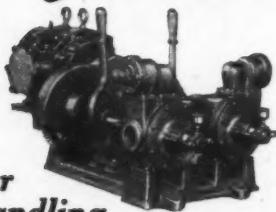
Both "Ardco" and "Sesmo" lubricators greatly prolong the life of curve rails—tire turning is minimized—curve resistance is reduced—safety is increased—and steel is saved!

ARDCO MANUFACTURING COMPANY
1116-1118 Paterson Plank Road
N. Bergen, N. J.



Sesmo Automatic Rail and Flange Lubricator

the PUMP that is "Self Adjusting for Wear"



for
handling
**DIESEL FUEL
and FUEL OILS**
BLACKMER ROTARIES

have been standard equipment for
more than forty years.

POWER PUMPS

5 to 750 GPM. Pressures to 300 psi.
Single or multiple units.

All standard drives.

HAND PUMPS

7 to 25 GPM—54 Models.
Write for Bulletin 304—

FACTS ABOUT ROTARY PUMPS

Blackmer Pump Company
2140 Century Ave., Grand Rapids 9, Mich.

BLACKMER ROTARIES
POWER PUMPS · HAND PUMPS

ELECTRICITY For Any Job—Anywhere

For a dependable source of electricity on projects remote from commercial power, Onan Electric Plants are proven leaders in the field. More than half of the Armed Forces' total requirements for Power Plants are built by Onan.

Gasoline driven Single-unit, compact design
Sturdy construction Sound engineering
Suitable for mobile, stationary or emergency service.

Model shown is
from W2C series 2 and 3KW

Over 65 models, ranging in sizes from 350 to 35,000 watts. 50 to 800 cycles, 110 to 660 volts, A.C.—6 to 4000 volts, D.C.—Also dual A.C.-D.C. output types.

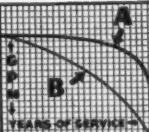
Descriptive literature sent promptly on request.

**D. W. ONAN
& SONS**
3185 Royalton Ave.
Minneapolis, Minn.



ONAN
ELECTRIC PLANTS

Awarded to each
of Onan's 4 Manufacturing Plants.



A—Blackmer pump capacity.
Note the long sustained efficiency.
B—Conventional Rotary Pump capacity.



Wear is confined to the tips of the buckets, which automatically compensate for wear.



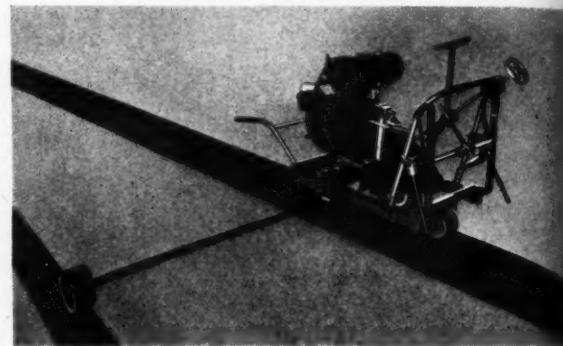
This much can wear away, without affecting the capacity of the pump.



When worn out, replace the buckets and the pump is restored to normal efficiency.

INSTALLING MORE RAIL IN '44?

You get longer-lasting installations with Railway Track-work Grinders. For faster surfacing of unequal rail heights, grinding slightly battered joints, smoothing welds and corrugations—with least time out for track obstruction. RTW grinders serve every maintenance need. Write for bulletins describing a variety of models.



Railway Track-work Model P-16 Stock Rail Grinder—one of many models.

Railway Track-work Co.

Clementine, Thompson & Mercer Streets
Philadelphia 34, Pa.

CLASSIFIED ADVERTISEMENTS

GOOD NEWS!

WPB REVOKES FREEZE ORDER
ON RELAY RAILS

NO PRIORITY OR RELEASE NOW REQUIRED
60#—70#—80#—85#—90#—100#—110#
AND OTHER SIZES NOW AVAILABLE—SPOT SHIPMENTS
ALSO CARS, RAILROAD EQUIPMENT, CAR PARTS, TUBES, NEW & USED
MERCHANT STEEL

HYMAN-MICHAELS COMPANY
122 South Michigan Avenue Chicago 3, Illinois

St. Louis—San Francisco—Portland, Ore.
Los Angeles—Norfolk, Va.—New York

CARS FOR SALE

Need cars for Coal, Coke, Ballast, Etc.?
The following list has 767 such cars!

- 150, Hopper, Double, 50-Ton
- 40, Hopper, Side-Discharge, 50-Ton
- 10, Koppel, Side-Discharge, 24-Yd., 30-Ton
- 100, Refrigerator, 40-Ft., 40-Ton
- 16, Refrigerator, 36-Ft., 30-Ton
- 25, Ballast, Composite, 50-Ton
- 150, Box, 36-Ft., 40-Ton; Steel Ends
- 10, Dump, K & J Automatic, 16-Yd., 30-Ton
- 2, Dump, Western, Automatic, 20-Yd., 40-Ton
- 25, Flat, 40-Ft., 40-Ton
- 55, Gondola, Composite, 36-Ft. & 40-Ft., 40-Ton
- 150, Tank, 8000-Gallon, 40-Ton and 50-Ton

Perhaps this list also has some other cars you could use to very beneficial advantage now?

All cars are priced to sell!

IRON & STEEL PRODUCTS, INC.

39 Years' Experience

13486 S. Brainard Ave. Chicago 33, Illinois
"ANYTHING containing IRON or STEEL"

LUFKIN "ANCHOR" CHROME CLAD STEEL TAPE FOR RAILROAD MEN

If you're looking for a quality steel tape, then a Lufkin "Anchor" Chrome Clad is the tape you want. Jet black markings on a satin chrome surface are easy to read—even in poor light. Surface won't rust, crack, chip or peel. Genuine leather hand-stitched case. Smooth winding mechanism. See your jobber and write for catalog.



LUFKIN
SAGINAW, MICHIGAN - NEW YORK CITY
TAPES - RULES - PRECISION TOOLS

It's a "Push-over" to line up tracks with the **BLOXHAM** TRACK LINER

Faster and easier for the men . . . no lifting, no stooping, no "heeling up." Proved best in road tests.

Order now . . . it will cut costs and save man-power.



Write for details and prices

CHICAGO STEEL FOUNDRY CO.
3701 S. Kedzie Avenue
Chicago 32, Illinois

Opening and Closing Joints . . . a One Man Job!



Simplex No. 555
Rail Puller and
Expander, 15-
ton capacity, 8'
expansion, 5' pull,
weight 44 lbs.

Pulling rails to close a joint.

The manpower savings provided by Simplex Rail Pullers and Expanders make them of greater value today than ever before—for controlling expansion and contraction of rail joints, lining crossings and switches, renewing insulated joints and end posts, and pushing or pulling continuous rail lengths. Their use prevents damage to rail ends, bolts and crossings.

Templeton, Kent & Co., Chicago (44), Ill.
Cutting Railroad Operating Costs Since 1899

For heavier rails—use the
No. 550 (25-ton cap.)
and the No. 550A (30-
ton cap.). Need not be
removed for passage of
trains.

Simplex
LEVER SCREW HYDRAULIC
Jacks

HOW TO **PATCH FLOORS** ... While Traffic Rolls

Here's a new, fast way to patch broken concrete without having to close off the area. Use durable INSTANT-USE . . . a tough, plastic material which you simply shovel into hole—tamp—and run traffic over immediately. NO WAITING. Bonds tight to old concrete. Makes smooth, solid, heavy-duty patch. Withstands extreme loads. Keep a drum on hand for emergencies. Immediate shipment.



REQUEST DESCRIPTIVE FOLDER
And Details of FREE TRIAL OFFER



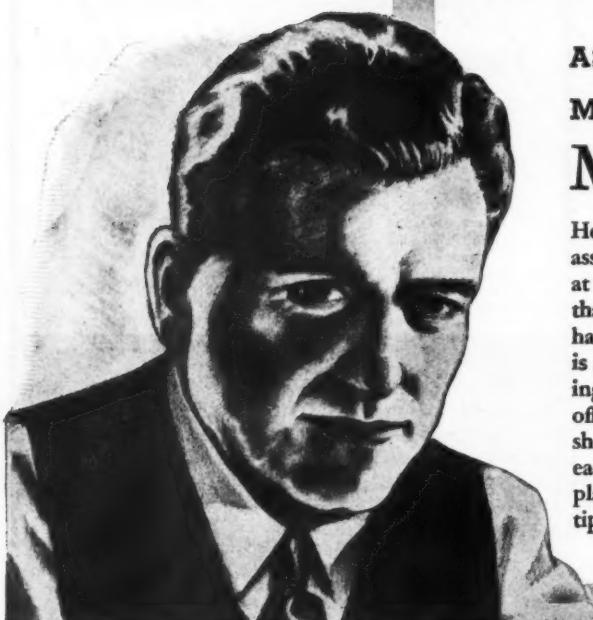
INSTANT-USE

FLEXROCK COMPANY

3647 Filbert St., Philadelphia 4, Pa.

Please send me complete INSTANT-USE information . . . details of FREE TRIAL OFFER—no obligation.

Name . . .
Company . . .
Address . . .



ASK YOUR JACKSON MAINTENANCE MAN ABOUT *Multiple Jack Method*

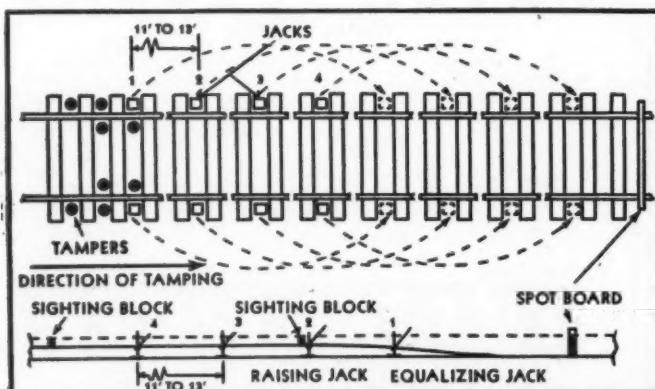
He will tell you that this method of tie-tamping assures uniformity, permits tie renewals to be made at the same time and accomplishes the work easier than any other method . . . that jack ties do not have to be double tamped and a uniform surface is maintained because settling is eliminated by leaving jacks in position during tamping until "tamped off" . . . that run-offs are quickly prepared by shoveling a small amount of ballast underneath each tie and dropping the jacks . . . He will explain how Jackson Vibratory tampers and the Multiple Jack method are used on leading railroads.



Multiple Jack method in operation. The number of jacks is determined by the quantity of tie renewals and size of gang. It has been found that eight jacks are the minimum for satisfactory operation even in small gangs. A minimum of eight jacks has proved the most satisfactory.



Eight or more jacks are spaced 11 to 13 feet apart with the lead pair operating as equalizers for the removal of rail sags or humps. The second pair are raising jacks and carry the rail to predetermined height indicated by spot board.



The Multiple Jack method of track tamping is demonstrated in this drawing.



ALPHABETICAL INDEX TO ADVERTISERS

and list of their products

Air Reduction Sales Co., 60 East 42nd St., New York 17, N.Y.	213
Oxygen; Acetylene; Acetylene Generators; Arc Welders; Argon; Atmospheric Gases; Carbide; Apparatus for Flame Cleaning, Dehydrating, Descaling, Descreaming, Desurfacing, Hardening, Machining and Softening, Rail End Welding; Neon; Nitrogen; Carbon Dioxide; Dry-Ice; Gas and Electric Welding Rods and Supplies; Mechanical Gas Cutting Machines; Welding and Cutting Apparatus; Rare Gases.	
American Brake Shoe Co., See Ramapo Ajax Division.	199
American Hoist & Derrick Co., St. Paul 1, Minnesota.	189
Hoists; Derricks; Locomotive Cranes; Gantry Cranes; Rail Handling Cranes; Wire Rope Blocks & Sheaves; Wire Rope Clips; Marine Deck Machinery; Shipyard Cranes; Winches, handpower and electric; Oilfield Engines.	
Ardo Manufacturing Co., 1116 Paterson Plank Road, North Bergen, N.J.	291
Rail and Flange Lubricators.	
Armco Railroad Sales Co., Inc., Middletown, Ohio.	172
Asbestos-Bonded Pipe; Automatic Drainage Gates; Bin-Type Retaining Walls; Corrugated Metal Pipe; Culverts; Insulated Pipe Units; Metal Cribbing; Multi Plate Arches; Multi Plate Pipe; Paved Invert Pipe; Part Circle Culverts; Perforated Pipe; Pipe-Arches; Sheetings; Portable Air Pipe; Spiral Welded Pipe; Steel Buildings; Structural Steel Plate Tunnel Lining; Blast Plates; Iron and Steel Sheets, Plain and Galvanized; Smoke Jacks.	
Barco Manufacturing Co., Not Inc., 1805 W. Winnemac Ave., Chicago 40, Illinois.	170
Gasoline Hammers; Tie Tamers; Flexible Joints.	
Blackmer Pump Company, Grand Rapids 9, Michigan.	292
Pumps; Rotary Automatic; Barrell (Hand operated). Belt Driven, Circulating, Close Coupled, Electric, Fire, Fuel Oil, Gasoline (Dispensing, etc.), Hand, Portable, Power; Strainers, Oil, Suction.	
Briggs & Stratton Corp., Milwaukee 1, Wisconsin.	285
Gasoline Engines.	
Buda Company, Harvey, Illinois.	221
Track Supplies; Diesel and Gasoline Motor Cars; Earth Drills; Hand and Push Cars; Lifting Jacks; Track Drills; Bonding Drills; Wheels; Rail Benders; Crossing Gates; Tie Nippers; Wrecking Frogs; Frogs and Switches; Industrial Shop Trucks; Track Liners; Bumping Posts and Car Stops; Diesel and Gasoline Engines; Generator Sets.	
Bush Pre-Fabricated Structures, Inc., 370 Lexington Avenue, New York 17, New York.	226
Pre-Fabricated Structures.	
Chain Belt Co., 1601 West Bruce St., Milwaukee 4, Wis.	196
Mixers; Moto-mixers; Pavers; Pumps; Pumpcretes.	
Chicago Steel Foundry Co., 3701 S. Kedzie Ave., Chicago 32, Illinois.	293
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Chipman Chemical Co., Inc., Bound Brook, New Jersey.	190
Chemical Weed Killers; Paints.	
Chicago Pneumatic Tool Co., 8 East 44 St., New York 17, N.Y.	198
Air Compressors; Electric Tools; Diesel Engines; Hydraulic Aviation Accessories; Pneumatic Tools; Rock Drills.	
The Cleveland Tractor Co., 19300 Euclid Ave., Cleveland 17, Ohio.	174
Gasoline and Diesel Powered Crawler Type Tractors.	
Cullen-Friestadt Company, 1301 So. Kilbourn Ave., Chicago 23, Illinois.	287
Anti-Slip Rail Tonga; Buckets, Clamshell; Cranes; Car Pullers; Derrick Cars; Locomotive Cranes; Rail Layers; Welding Positioners.	
Dearborn Chemical Co., 310 South Michigan Ave., Chicago 4, Illinois.	169
Automatic Blowdown System; Rust Preventive; Tank Sealing Compound; Water Treatment.	
Duff-Norton Manufacturing Co., The Pittsburgh, Penn.	208
Jacks; Air Motor Operated, Automatic Lowering, Horizontal, Journal, Lifting, Pipe Forcing, Pull, Push, Screw, Self Lowering High Speed, Special Purpose, Track; Tie Pullers; Tie Spacers.	
Elastic Rail Spike Corp., 420 Lexington Ave., New York 17, N.Y.	191
Rail Spikes; Spikes, Rail.	
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Spring Lock Washers; Lock Washers; Nut Locks, Spring Washers; Extoserts; Screw, Bolt and Washer Assemblies; Snap, Bearing, Lock and Retainer Rings; Cold-Drawn Steel.	
Electric Tamper & Equipment Co., Ludington, Mich.	294
Concrete Vibrators, Electric and Hydraulic, Mechanical and Flexible Shaft Driven; Electric Power Units; Power Plants, Portable; Tie Tamers.	
Fairbanks, Morse & Co., Fairbanks-Morse Bldg., Chicago 5, Ill.	216-217
Track Cars, Motor, Push, Hand and Velocipede; Water Columns; Oil Columns; Tank Fixtures; Cattle Guards; Diesel Engines; Motors	
and Generators; Pumps; Scales; Windmills; Coaling Stations; Cinder and Ash Handling Equipment.	
Fairmont Railway Motors, Inc., Fairmont, Minnesota.	186-187
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Flexrock Company, 3647 Filbert St., Philadelphia 4, Penn.	293
Concrete Resurfacer; Resurfacing Compound; Water-proofing Compounds; Dye for Wood or Concrete Floors; Floor Wax; Paint Cleaning Materials; Roofing Materials.	
Holyoke Compressor and Air Tool Dept., Holyoke, Mass.	175
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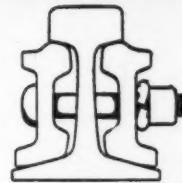
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A complete line of heavy duty air-cooled engines in 1 and 4 cylinder types, 1 to 35 hp., including complete power units with clutch and reduction assemblies.		
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